2019 Air Quality Annual Status Report (ASR) 2nd Version

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

June 2019 (Updated July 2020 with Addendum)

Local Authority Officer	Ian Gaskell
Department	Environmental Health
Address	Knowsley Metropolitan Borough Council, Municipal Buildings, Archway Road, Huyton, L36 9YU
Telephone	0151 443 4712
E-mail	environmental.health@knowsley.gov.uk
Report Reference number	Knowsley 19 (2nd Version)
Date	July 2020

July 2020 Addendum

For transparency, the main report initially submitted is unchanged. This addendum has been produced on request of the LAQM Helpdesk due to new findings as discussed below. The information in this addendum section will replace the relevant parts of the main report.

Following the completion of the 2019 ASR, one site (site 3) showed there to be a borderline exceedance of the Air Quality Objective (AQO) for nitrogen dioxide, of 41.7 µg/m^3, when compared to the annual AQO of 40 µg/m^3. In our conclusions we therefore discussed carrying out a detailed assessment to determine if we needed to declare an AQMA.

Prior to the detailed assessment being carried out checks were made at the site to ensure all the measurements used were correct. Through this check we discovered that the measurements used in the report were slightly different from the actual site measurements. Using these new measurements has shown that the predicted level at the sensitive receptor has changed. In fact, when using the correct measurements the result for site 3 has reduced to 40.6 µg/m^3**.** See below;

Table A.2 – Details of Non-Automatic Monitoring Sites (amended for Site 3)

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

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Tube collocated with a Continuous Analyser?	Height (m)
3	Outside1 Whitefield Lane	Kerbside	345563	389399	NO2	NO	2.8	0.8	NO	2.5

The new measurements were then inputted into the Bureau Veritas NO_2 fall of with distance calculator and the predicted level can be seen in the table below;

Figure B.1: Bureau Veritas NO_2 fall off with distance calculator (amended for Site 3)

Site Name/ID	Distance (m)		NO_2 Annual Mean Concentration (µg/m^3)			Comment
	Monitoring Site to Kerb	Receptor to Kerb	Background	Monitored at Site	Predicted at Receptor	
Site 3	0.8	3.6	19.4	49.3	**40.6**	Predicted concentration at Receptor above AQS objective.

Table B.1 – NO2 Monthly Diffusion Tube Results – 2018 (amended for Site 3)

Site ID	NO_2 Mean Concentrations (µg/m^3)														
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean		
													Raw Data	Bias Adjusted (factor) and Annualised (1)	Distance Corrected to Nearest Exposure (2)
3	61.1	71.7	74.2	60	66.5	59.8	54.95	49.2	52.55	62.3	69.85	66.9	62.4	**49.3**	**40.6**

In light of this result and although still a minor exceedance of the AQO, our 2019 results, which we have been working on as part of our 2020 ASR submission, are showing no exceedances at the sensitive receptors. Also, given the Covid 19 situation in 2020 and the significant drop in the nitrogen dioxide levels in the borough, due to the lockdown, it appears that the levels we will be reporting next year for our 2021 ASR will have reduced even further.

We therefore propose;

a. That a detailed assessment in the area of site 3 is not required at this moment in time, and
b. That we continue with the diffusion tube monitoring in the area of site 3.

Executive Summary: Air Quality in Our Area

Air Quality in Knowsley Council Area

Air pollution is associated with a number of adverse health impacts. It is recognised as a contributing factor in the onset of heart disease and cancer. Additionally, air pollution particularly affects the most vulnerable in society: children and older people, and those with heart and lung conditions. There is also often a strong correlation with equalities issues, because areas with poor air quality are also often the less affluent areas[1,2].

The annual health cost to society of the impacts of particulate matter alone in the UK is estimated to be around £16 billion[3].

Local monitoring data, the planning system, traffic information and control of industries by Environmental Permits have been utilised so that there is a continuing examination of the local air quality to ensure that all Air Quality Objectives set by the Government are met.

The main sources of air pollution in Knowsley, as identified from previous air quality review and assessments and the work carried out in the Merseyside Atmospheric Emissions Inventory, are from road traffic vehicle emissions and from 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 and the Huyton, Kings and Prescot Business Parks situated in the centre of the borough, and Jaguar Land Rover car plant in Halewood. Neighbouring authorities also house large industries that can have an impact on the air quality in Knowsley. For example, Fiddlers Ferry power station in Warrington lies to the south of the borough, the Shell oil refinery and petro-chemical complex in Ellesmere Port lie 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 communication links. The M57 is the 'backbone' of the Borough, running North West to South East. The M62 and A580

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

(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.

The Council's background urban air quality monitoring site in Kirkby, which operated from 2008–2017, demonstrated long term compliance with the air quality objectives and so monitoring here was ceased in favour of monitoring at different locations.

In 2018, Knowsley Council had two sites continuously monitoring nitrogen dioxide and particulate matter at Cronton Road, Huyton and Higher Road, Halewood.

Actions to Improve Air Quality

Key completed measures in Knowsley are:

- Air Quality Steering Group held regular meetings.
- The production of the Annual Status Report 2019.
- Secured funding and selected sites to extend our nitrogen dioxide diffusion tube network.
- Secured funding to extend our continuous monitoring programme in Kirkby.
- Worked within the planning system to help embed the role of air quality in sustainable development.
- Worked closely with neighbouring authorities and other partner agencies.
- City Region Air Quality website in development
- The following Sustainable Travel Enhancement Package (STEP) cycleway related works were carried out:

    STEP Huyton to Prescot Gateway (Phase 3 - Liverpool Road / Longview Lane). Off Road Cycleway - 1330 metres

    STEP Connect Whiston - Pennywood Drive. On road cycle route - 540 metres

As part of the Liverpool City Region, Knowsley will also contribute to regional initiatives to improve air quality. A preliminary options study of various air quality intervention has been prepared by AECOM in consultation with Merseytravel and the LCR Combined Authority and was published in March 2018.

Knowsley Council continues to work with other Liverpool City Region authorities, Merseytravel, Environment Agency and other partners to improve air quality within the borough. A Liverpool City Region Combined Authority Air Quality Group has been created to identify opportunities in the Liverpool City Region (LCR) to improve air quality, and achieve associated benefits to health and well-being, whilst supporting regional growth and development aspirations.

Conclusions and Priorities

From 2016, two continuous roadside monitors for nitrogen dioxide and particulate matter were installed in Huyton and Halewood. The Halewood site continues to demonstrate compliance with the air quality objectives in 2018. However, some of the monitoring data we have for Huyton suggests a borderline exceedance in the annual nitrogen dioxide air quality objective. In light of these results, a detailed assessment will be required to ascertain the extent of the potential Air Quality Management Area (AQMA). The subsequent Air Quality Action Plan (AQAP) will then need to be produced. Meetings will be held with key stakeholders (including Public Health, Planning and Highways) to determine what action can be taken to address the exceedance.

Priorities;

- Diffusion tube monitoring will begin at 20 new sites, selected as part of the extension of the Knowsley air quality monitoring network.
- Continuous monitoring to restart at a new site in Kirkby. Data will be reported in the 2020 ASR.
- Further assessment of the Huyton nitrogen dioxide data to determine the extent and scope of a potential AQMA. Prepare subsequent AQAP.
- Promoting air quality considerations as part of major developments including:
  - **Beacon 62**, Cronton Road, Huyton – a commercial development including new food store, car show room, petrol station, drive thru restaurant and coffee shop.
  - **Halsnead Garden Village, off Tarbock Island, M62, Huyton** - the largest combined housing and employment sites in the Liverpool City Region

delivering approximately 1,600 homes and at least 22.5ha of employment land.

Challenges;

Both of the Beacon 62 and Halsnead developments will be challenging as both developments are likely to have an impact on the Huyton air quality monitoring site as a result of the increase in traffic.

Knowsley Council faces significant budget cuts from central government and continuing to provide projects and services related to monitoring and improving air quality will be a major challenge.

Local Engagement and How to get Involved

The public can help improve air quality in Knowsley by:

- Reducing the use of cars by, walking, cycling, car-sharing or using public transport instead.
- Considering electric or hybrid vehicles when buying a new car.
- Not leaving vehicles idling. Turn off the engine instead and use the stop start technology in newer vehicles where available.
- Not burning waste on bonfires or wood burners. Dispose of household waste using the waste collection service or compost garden waste instead.
- Use the Energy Savings Trust website (www.energysavingtrust.org.uk) for advice on saving energy in the home and business.
- Providing responses to planning applications that may impact on air quality, and in doing so this will challenge the applicants at a time when design can change and air quality impacts could be reduced as much as possible.

Further information and live air quality information from Knowsley Council's automatic monitoring site is available from our website:

http://www.knowsley.gov.uk/residents/bins-waste-and-environment/air-quality

Table of Contents

List of Tables

List of Figures

1 Local Air Quality Management

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

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

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

2 Actions to Improve Air Quality

2.1 Air Quality Management Areas

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

Knowsley has identified an area where an AQMA will need to be declared. We are now in the process of carrying out a detailed assessment to determine how far the area will extend. For reference, a map of Knowsley's monitoring locations is available in Appendix D. Map 5 shows the location of the Huyton air quality monitoring station and this is the area where an AQMA needs to be declared.

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

Defra's appraisal of last year's ASR concluded

The report is well structured, using the latest template, and provides the information specified in the Guidance. The following comments are made to inform future reports.

1. The review of current monitoring, highlights the importance of monitoring results as a basis for determining whether air quality problems exist within the Borough.
2. Local authorities in the UK have a responsibility under Local Air Quality Management (LAQM) legislation to review air quality in their area.
3. We note the Council's priorities include an expansion to the current monitoring programme. This is welcomed.
4. A detailed consideration should take place across the Borough to determine locations of relevant exposure closest to busy and congested traffic routes. The monitoring programme should then be reviewed to consider additional locations that have not been previously considered, in order to provide a clear picture of the status of local air quality.
5. The report makes reference to significant proposed extensions to the current urban areas within the Borough, these areas should also be given due consideration within future monitoring strategies.
6. The results of 4 months monitoring are not adequate as a representative result for 2017, and future results tables should be amended accordingly.

Knowsley MBC has taken forward a number of direct measures during the current reporting year of 2018 in pursuit of improving local air quality. More detail on these measures can be found in the following documents;

Joint Strategic Needs Assessment (Environment)

This report has been prepared jointly by Knowsley Council and Knowsley Clinical Commissioning Group (CCG) and it is one of a series of reports that contributes to Knowsley's Joint Strategic Needs Assessment (JSNA). Its purpose is to provide an analysis of the environment and related issues in order to address questions such as:

- How much impact do these issues have on local people?
- Can this impact be reduced through local action?
- Can local action reduce health inequalities?
- Will local action on this help address other issues too?

This report, along with others produced as part of the JSNA, will be used to inform strategies and plans produced by the Council and its partners. In particular, the JSNA meets the statutory responsibility that the Council and CCG share to study the needs of local people in order to inform the development of a Joint Health and Wellbeing Strategy. The JSNA is also the main source of intelligence used to develop the Knowsley Partnership's 'Strategy for Knowsley'.

The Sustainable Transport Enhancements Package

The Sustainable Transport Enhancements Package (STEP) is a package of sustainable transport infrastructure measures integral to the Liverpool City Region (LCR) Growth Plan and Strategic Economic Plan (SEP). Although in its infancy, investment in STEP will be shaped around four interrelated strategic packages of works. These align with those set out in the SEP Investment Pipeline for the City Region and are as follows;

- Transport Investment for Growth;
- Sustainable Access to Employment and Opportunity;
- Transport and Low Carbon Opportunities; and
- Travel for the Visitor Economy.

Investment will be directed into seven Growth Zones, which align with the key areas for investment and development across the City Region, based on the growth sites identified in the SEP. The Environmental Impact Assessment concludes there is likely

to be a slight beneficial impact on local and regional air quality as a result of the scheme.

As part of the Liverpool City Region, Knowsley will also contribute to regional initiatives to improve air quality. A preliminary options study of various air quality intervention has been prepared by AECOM in consultation with Merseytravel and the LCR Combined Authority and was published in March 2018.

Key completed measures in Knowsley are:

- The formation of an Air Quality Steering Group and the appointment of a chair.
- The commencement of passive monitoring of NO_2 in the area around the Cronton Road automatic monitoring station.
- The production of the Annual Status Report 2018.
- A communication strategy has been developed to encourage public engagement, deliver key messages related to air quality and to ensure effective joint working with external partners.

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

- Recommence automatic monitoring of NO_2, PM_{10} and $PM_{2.5}$ in Kirkby in a new location that would provide a better indicator of public exposure to air pollution.
- Expand passive monitoring of NO_2 into the towns of Prescot and Kirkby
- Increased engagement and participation with events and promotion of Clean Air Day
- Knowsley Council have already agreed in 2018 to the 100% Clean Energy City Pledge to devise plans to achieve 100% clean energy locally by 2050 and to work with partners to promote the principles of the 100% Clean Energy City Pledge with the aim of making a material contribution to emissions reductions.
- Sustainable Transport Enhancement Schemes walking and cycling routes are being constructed :
    - STEP Huyton to Prescot Gateway (Phase 3 - Liverpool Road / Longview Lane). Off Road Cycleway - 1330 metres
    - STEP Connect Whiston - Pennywood Drive. On road cycle route - 540 metres

- At present each local authority has its own air quality pages, hosted within the Council websites and these vary in terms of design, amount of information and type of content. Funding has been secured from DEFRA air quality grants to create a stand-alone website which will have content which is pertinent to all the Local Authorities within the LCR. A substantial element of the web platform will be dedicated to providing educational resources for primary and secondary schools to utilise.

Knowsley's priorities for the coming year are to expand the monitoring network within the borough. This will include monitoring by automatic monitoring station(s) and diffusion tubes and is likely to focus on towns that have not been monitored in recent years such as Prescot and Kirkby.

The principal challenges and barriers that Knowsley Council anticipates facing, regarding the implementation of projects and services relating to air quality, include significant budget cuts from central government. It is also anticipated that there will be a significant increase in the number of new housing and commercial developments within the borough. These include Sustainable Urban Extensions (SUE).which will increase the urban area of the borough at the cost of rural land. The associated increase in road traffic is likely to have a negative impact on air quality, however the extent of impact will need to be assessed via the planning system.

2.3 $PM_{2.5}$ – Local Authority Approach to Reducing Emissions and/or Concentrations

As detailed in Policy Guidance LAQM.PG16 (Chapter 7), Local Authorities are expected to work towards reducing emissions and/or concentrations of $PM_{2.5}$ (particulate matter with an aerodynamic diameter of 2.5µm or less). There is clear evidence that $PM_{2.5}$ has a significant impact on human health, including premature mortality, allergic reactions, and cardiovascular diseases.

One of the biggest health burdens is understood to be from long-term exposure to particulate air pollution. Studies have shown that long-term exposure to air pollution reduces life expectancy by increasing deaths from cardiovascular and respiratory conditions and from lung cancer. The evidence suggests that exposure to fine particulate pollution may be the main cause. The Public Health Outcomes Framework (PHOF) for England reports on a range of indicators for local authorities, including an indicator for air pollution expressed as the fraction of adult mortality attributable to long-term exposure to human-made particulate air pollution. The PHOF allows for the assessment in the importance of air pollution locally, alongside other factors detrimental to public health.

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

- Continue to monitor, analyse and report on $PM_{2.5}$ at our two automatic monitoring sites. Any future monitoring sites introduced as part of the expansion of the monitoring network will include $PM_{2.5}$ monitoring as standard.
- Identify developments that could 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 a key focus for new planning applications and Environmental Permitting.
- Identify existing measures already in place that can help with reducing levels of $PM_{2.5}$
- The Public Health Outcome Framework for $PM_{2.5}$ is considered as part of Knowsley's JSNA Report. This outcome indicator is the percentage of all-cause death in adults over 30 attributed to small (<2.5 µm) particulate, man-made air pollution. It is a modelled estimate based on the relative risk incurred per 10 $\mu g/m^3$ increase above local average background levels. The attributable fraction

in England is 5.4%, whilst for the North West as a whole this is lower, at 4.6%. In Knowsley the attributable fraction is 4.8%.

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

3.1 Summary of Monitoring Undertaken

Monitoring of the air quality in Knowsley, in 2018, has demonstrated that the results from the continuous monitors we have in Halewood and Huyton are below the AQO for both nitrogen dioxide and particulate matter (PM_{10}). However, out of the 12 diffusion tube sites in Huyton, two sites showed elevated levels of nitrogen dioxide. After carrying out further assessment of the results it can be seen that one site exceeds the annual AQO (site 3) and one (site 2) is close to exceeding the objective when looking at the results obtained and the distance to the receptor. For the majority of the diffusion tube sites, positioned close to a receptor, no specific trend could be seen apart from the results being below the AQO for the majority of time. Diffusion tubes at site 3, have been consistently above 40 ug/m^3 (with one exception) and even with the bias adjustment and NO_2 drop off calculation, it is still predicted to be above the annual Air Quality Objective of 40ug/m^3 at the closest receptor. This could potentially result in an AQMA being declared due to an exceedance of the annual Air Quality Objective for nitrogen dioxide. Moving forward Knowsley Council will now look at carrying out a detailed assessment of this area and seek additional evidence before any decision on the declaration of an AQMA is made. There are potential developments in the near future in this potential AQMA which could further impact on the air quality.

3.1.1 Automatic Monitoring Sites

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

Knowsley undertook automatic (continuous) monitoring at 2 sites during 2018. Table A.1**Error! Reference source not found.** in Appendix A shows the details of the sites. National monitoring results are available at, https://uk-air.defra.gov.uk/.

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

3.1.2 Non-Automatic Monitoring Sites

Knowsley undertook non- automatic (passive) monitoring of NO_2 at 12 sites during 2018. Table A.2 in Appendix A shows the details of the sites.

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

3.2 Individual Pollutants

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

3.2.1 Nitrogen Dioxide (NO_2)

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

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

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

No exceedances in the hourly mean concentrations were recorded.

A marginal exceedance of the annual objective is noted at the passive monitoring site 3. An ambient concentration of 41.7 µg/m^3 is noted in comparison to the guideline of 40.0 µg/m^3. Further assessment is required before the extent of the AQMA can be clearly defined

Having a limited amount of monitoring data, 3 years, no trend has been indentified at either the Halewood or Huyton sites although the annual mean of nitrogen dioxide at the Huyton site has been consistently above 36 ug/m^3.

Monitoring of NO_2 at the Kirkby site ceased at the beginning of 2017 due to equipment failure. The data from the Kirkby monitoring location had shown that concentrations of

NO_2 had slightly declined following a noticable peak in 2014, however levels were consistently and significantly below the limit.

Further monitoring is required at the Huyton and Halewood automatic monitoring stations to be able to identify any clear trends within the data.

3.2.2 Particulate Matter (PM_{10})

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

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

No exceedances of the air quality objectives were recorded.

The results from the PM_{10} monitor in Huyton, over the past 3 years are consistent and are below the AQO.

The results from the PM_{10} monitor in Halewood, over the past 3 years, show consistent compliance the the AQO and have shown a decrease each year.

3.2.3 Particulate Matter ($PM_{2.5}$)

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

Although there is no air quality objective for England, it is noted that the recorded levels are below the EU Air Quality standard (25 µg/m^3) for the two active sites, with both the Huyton and Halewood sites showing similar levels over the past 3 years.

Appendix A: Monitoring Results

Table A.1 – Details of Automatic Monitoring Sites

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Monitoring Technique	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Inlet Height (m)
Huyton	Cronton Road, Huyton	Roadside	345552	389413	NO_2; PM2.5 PM10,	NO	Chemiluminescent, TEOMS	18	2	2
Halewood	Higher Road, Halewood	Roadside	345213	384691	NO_2; PM2.5 PM10,	NO	Chemiluminescent, TEOMS	10	2	2
Kirkby(3)	Briery Hey Avenue, Northwood	Urban Background	345552	433175	PM2.5 PM10,	NO	BAMS	35	16	2.5

Notes:

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

(2) N/A if not applicable.

(3) This monitoring site is no longer active but has been included as some of the results in this report make reference to this site.

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

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Tube collocated with a Continuous Analyser?	Height (m)
1	Station co-location	Roadside	345552	389413	NO_2	NO	18.0	2.0	YES	2
2	Outside 2 Whitefield Lane	Roadside	345536	389406	NO_2	NO	2.3	1.3	NO	2.5
3	Outside1 Whitefield Lane	Kerbside	345563	389399	NO_2	NO	2.7	0.7	NO	2.5
4	Opp Smithford Walk	Roadside	345516	389326	NO_2	NO	7.1	1.6	NO	2.5
5	Sevenoak Grove	Roadside	345675	389363	NO_2	NO	2.9	1.3	NO	2.5
6	Wilson Rd Jct	Roadside	345878	389437	NO_2	NO	N/A	3.8	NO	2.5
7	Tarbock Island	Roadside	345996	389471	NO_2	NO	20.4	1.6	NO	2.5
8	Natruscot	Roadside	345301	389479	NO_2	NO	30.5	2.5	NO	2.5
9	Outside 29 Southford Walk	Suburban	345596	389180	NO_2	NO	5.4	0.5	NO	2.5
10	Outside 9 Ribchester Way	Suburban	345424	389325	NO_2	NO	6.7	1.3	NO	2.5
11	Outside 12 Windy Arbor Brow	Suburban	346329	389782	NO_2	NO	5.0	1.3	NO	2.5
12	Halsnead development	Roadside	346425	389669	NO_2	NO	N/A	3.0	NO	2.5

Notes:

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

(2) N/A if not applicable.

Table A.3 – Annual Mean NO_2 Monitoring Results

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2018 (%) (2)	NO_2 Annual Mean Concentration (µg/m^3) (3)				
					2014	2015	2016	2017	2018
Kirkby	Urban Background	Automatic	0	0	26.9	18.7	17.7	N/A	N/A
Huyton	Roadside	Automatic	99.7	99.7	N/A	N/A	38.8	36.2	37.4
Halewood	Roadside	Automatic	99.9	99.9	N/A	N/A	32.3	27.8	30.3
1	Roadside	Diffusion Tube	100	100	N/A	N/A	N/A	40.0	37.5
2	Roadside	Diffusion Tube	100	100	N/A	N/A	N/A	39.9	**41.0**
3	Kerbside	Diffusion Tube	100	100	N/A	N/A	N/A	**47.7**	**49.3**
4	Roadside	Diffusion Tube	100	100	N/A	N/A	N/A	26.7	29.8
5	Roadside	Diffusion Tube	100	100	N/A	N/A	N/A	25.1	26.8
6	Roadside	Diffusion Tube	100	100	N/A	N/A	N/A	29.2	30.0
7	Roadside	Diffusion Tube	100	100	N/A	N/A	N/A	36.2	36.8
8	Roadside	Diffusion Tube	100	100	N/A	N/A	N/A	26.7	26.6
9	Suburban	Diffusion Tube	100	100	N/A	N/A	N/A	26.3	25.0
10	Suburban	Diffusion Tube	100	100	N/A	N/A	N/A	22.9	23.3
11	Suburban	Diffusion Tube	100	100	N/A	N/A	N/A	28.6	26.4
12	Roadside	Diffusion Tube	92.3	92.3	N/A	N/A	N/A	35.5	33.5

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

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

Notes:

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

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

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

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

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

Figure A.1 – Trends in Annual Mean NO_2 Concentrations

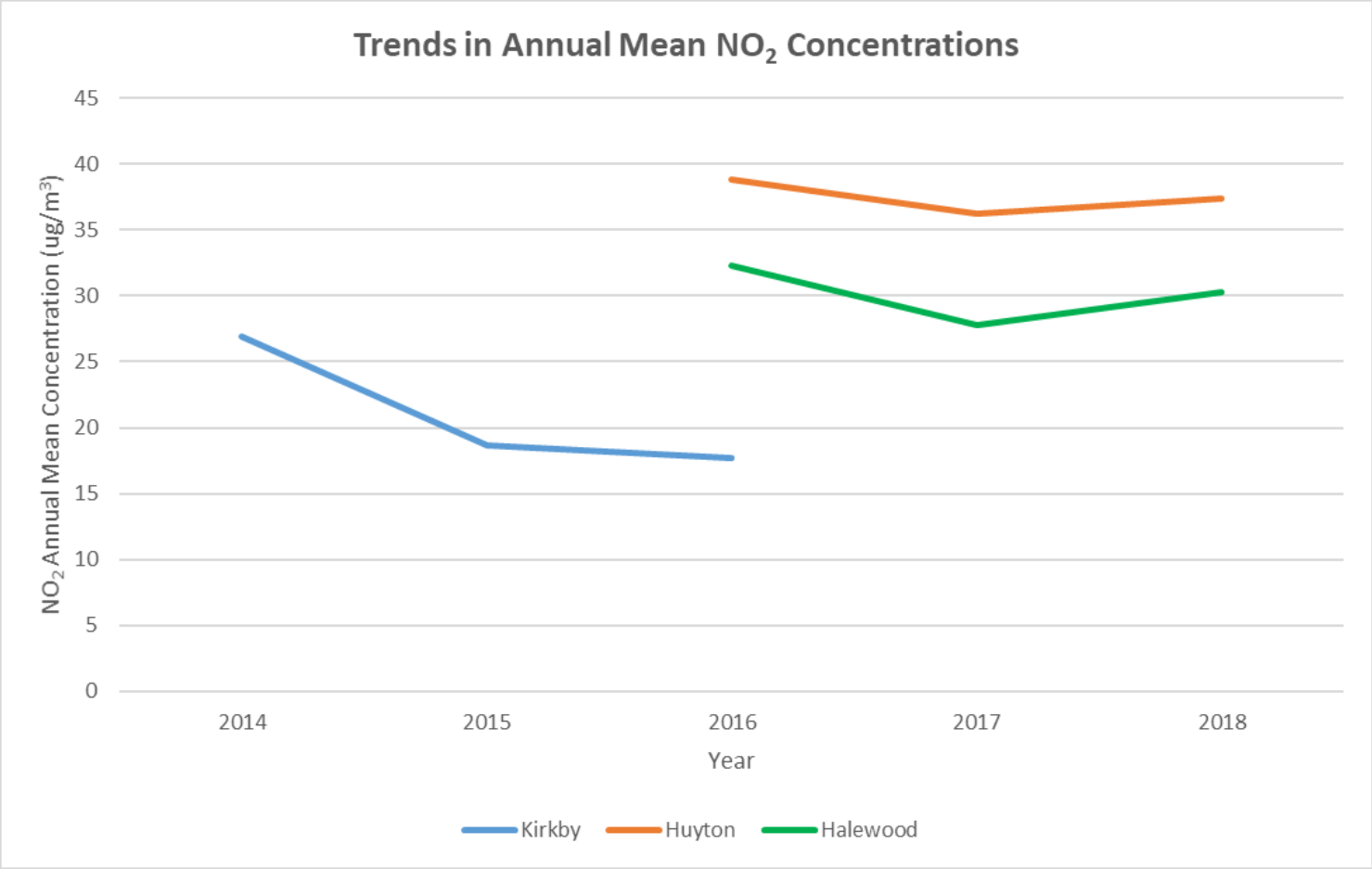


Table A.4 – 1-Hour Mean NO_2 Monitoring Results

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2018 (%) (2)	NO_2 1-Hour Means > 200µg/m^3 (3)				
					2014	2015	2016	2017	2018
Kirkby	Urban Background	Automatic	0	0	0 (112.2)	0	0 (87.8)	N/A	N/A
Huyton	Roadside	Automatic	99.9	99.9	N/A	N/A	0 (130.4)	0	0
Halewood	Roadside	Automatic	98.3	98.3	N/A	N/A	0 (117.0)	0	0

Notes:

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

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

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

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

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

Site ID	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2018 (%) (2)	PM_{10} Annual Mean Concentration ($\mu g/m^3$) (3)				
				2014	2015	2016	2017	2018
Kirkby	Urban Background	0	0	18.0	16.5	17.9	19.6	0
Huyton	Roadside	99.2	99.2	N/A	N/A	20.0	22.5	21.8
Halewood	Roadside	97.3	97.3	N/A	N/A	24.8	20.8	16.8

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

Notes:

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

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

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

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

Figure A.2 – Trends in Annual Mean PM_{10} Concentrations

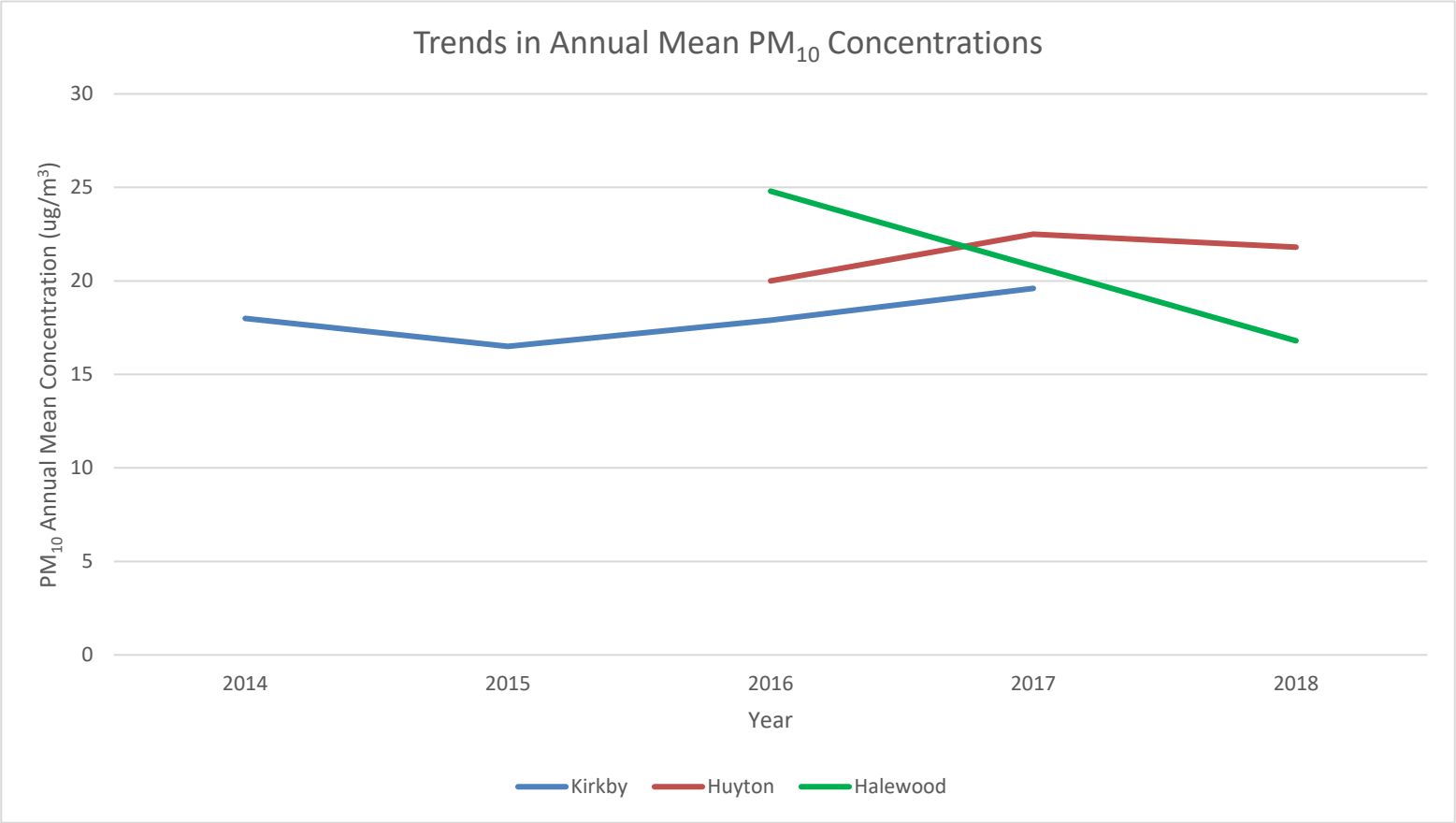


Table A.6 – 24-Hour Mean PM_{10} Monitoring Results

Site ID	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2018 (%) (2)	PM_{10} 24-Hour Means > 50µg/m^3 (3)				
				2014	2015	2016	2017	2018
Kirkby	Urban Background	0	0	8	4 (30.8)	0	0 (27.5)	N/A
Huyton	Roadside	99.2	99.2	N/A	N/A	2 (32.9)	5	1
Halewood	Roadside	97.3	97.3	N/A	N/A	8 (43)	5	3

Notes:

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

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

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

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

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

Site ID	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2018 (%) (2)	$PM_{2.5}$ Annual Mean Concentration ($\mu g/m^3$) (3)				
				2014	2015	2016	2017	2018
Kirkby	Urban Background	95.1		N/A	6.8	10.9	8.4	N/A
Huyton	Roadside	100	100	N/A	N/A	10.1	9.5	9.1
Halewood	Roadside	98.4	98.4	N/A	N/A	11.1	8.6	9.2

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

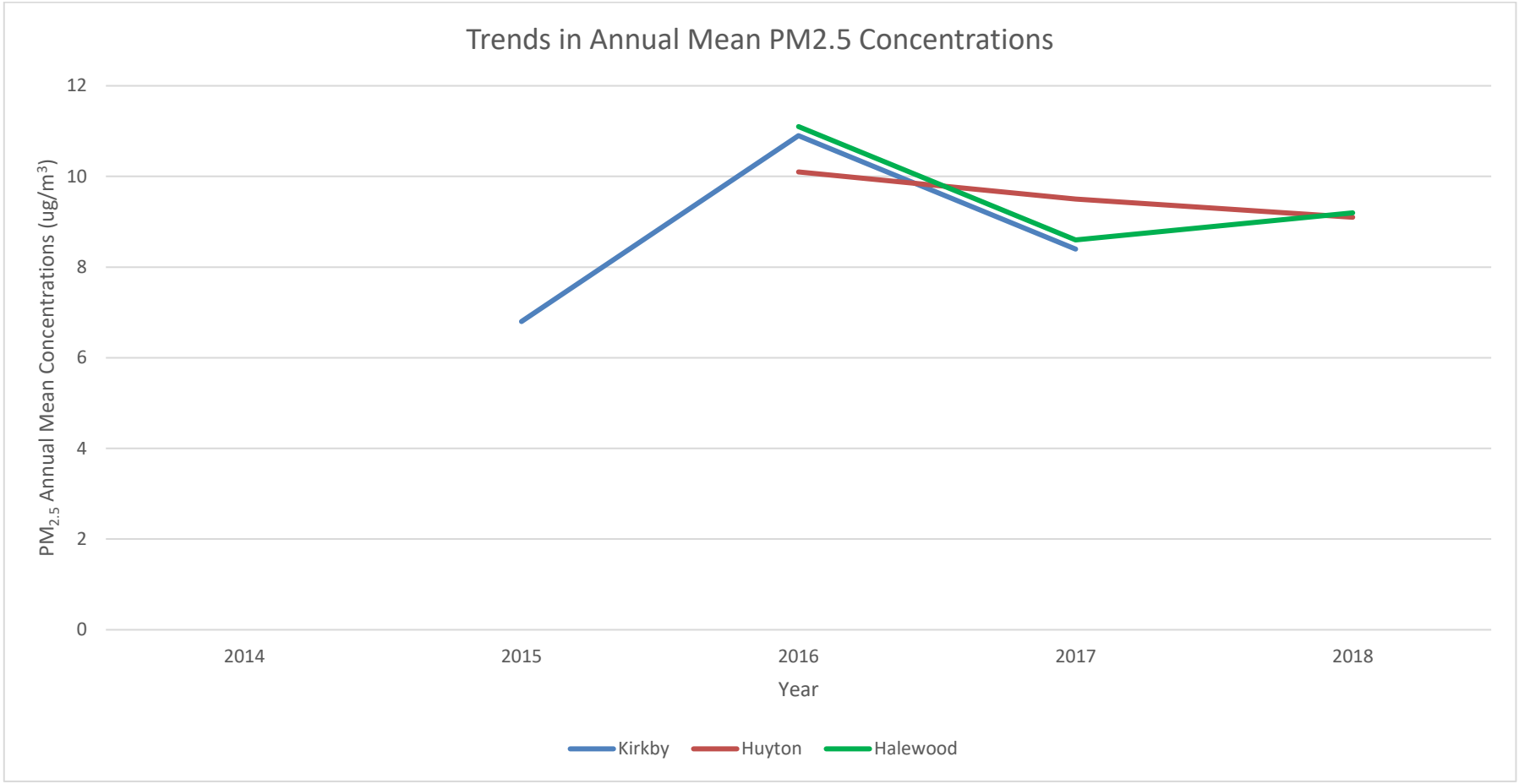
Notes:

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

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

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

Figure A.3 – Trends in Annual Mean $PM_{2.5}$ Concentrations



Appendix B: Full Monthly Diffusion Tube Results for 2018

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

Site ID	NO_2 Mean Concentrations ($\mu g/m^3$)														
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean		
													Raw Data	Bias Adjusted (0.79) and Annualised (1)	Distance Corrected to Nearest Exposure (2)
1	50.9	55.4	52.7	45.4	40.5	42.35	42.8	39.95	40.5	45.65	52.05	61.3	47.5	37.5	36.2
2	59.6	59.5	64.9	49.7	51.15	45.85	47.0	36.9	42.75	54.3	49	61.9	51.9	**41.0**	38.4
3	61.1	71.7	74.2	60	66.5	59.8	54.95	49.2	52.55	62.3	69.85	66.9	62.4	**49.3**	**41.7**
4	40.9	45.4	47.45	38.25	32.15	31.25	29.15	26.25	28.4	39.2	47.05	47.6	37.8	29.8	26.3
5	36.6	39.25	42.65	31.9	33.95	33.3	27.85	24.15	24.75	34.05	36.05	42.15	33.9	26.8	25.5
6	35.0	44.35	49.4	32.8	33.5	34.3	28.95	26.75	27.05	40.4	51.95	51.15	38.0	30.0	*
7	54.5	48.75	60.4	43.7	34.75	36.25	38.8	36.2	39.8	47.3	56.15	62.5	46.6	36.8	26.9
8	41.05	40.1	45.65	32.3	27.35	26.1	25.6	23.8	21.8	35.45	41.2	43.35	33.6	26.6	22.1
9	38.45	40.3	34.2	30.2	26.2	24.1	24.9	22.85	27.7	34.9	32.15	44.1	31.7	25.0	22.6
10	36.65	36.75	42.05	28.55	22.9	21.4	20.85	20.5	22.65	31.5	33.45	36.75	29.5	23.3	21.9
11	44.15	34.25	39.45	30.1	22.2	24.6	25.45	28.8	28.9	36.25	38.75	48.65	33.5	26.4	24.4
12	48.4	47.85	48.4	38.5	30.45	No data	42.1	38.3	40.45	47.05	41.2	44.45	42.5	33.5	*

☒ **Local bias adjustment factor used**

☐ **National bias adjustment factor used**

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

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

Notes:

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

***** Distance to relevant exposure is not applicable.

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

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

(2) Distance corrected to nearest relevant public exposure.

Figure B.1: Bureau Veritas NO_2 fall off with distance calculator

Enter data into the pink cells

Site Name/ID	Distance (m)		NO_2 Annual Mean Concentration ($\mu g/m^3$)			Comment
	Monitoring Site to Kerb	Receptor to Kerb	Background	Monitored at Site	Predicted at Receptor	
1	2	2.7	19.4	37.5	36.2	Predicted concentration at Receptor within 10% the AQS objective.
2	1.3	2.3	19.4	41.0	38.4	Predicted concentration at Receptor within 10% the AQS objective.
3	0.7	2.7	19.4	49.3	**41.7**	Predicted concentration at Receptor above AQS objective.
4	1.6	7.1	19.4	29.8	26.3	
5	1.3	2.9	19.4	26.8	25.5	

Enter data into the pink cells

Site Name/ID	Distance (m)		NO_2 Annual Mean Concentration ($\mu g/m^3$)			Comment
	Monitoring Site to Kerb	Receptor to Kerb	Background	Monitored at Site	Predicted at Receptor	
7	1.6	20.4	19.4	36.8	26.9	Warning: your receptor is more than 20m further from the kerb than your monitor - treat result with caution.
8	2.5	30.5	19.4	26.6	22.1	Warning: your receptor is more than 20m further from the kerb than your monitor - treat result with caution.
9	0.5	5.4	19.4	25.0	22.6	
10	1.3	6.7	19.4	23.3	21.9	
11	1.3	5	19.4	26.4	24.4	

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

C.1 Significant changes to sources

The following sources have been identified as part of the planning regime as being new sources of pollution in 2018

Planning Reference: 18/00062/HYB, Granted: 17th July 2018

Proposal: Detailed planning permission for 4,180 sqm employment floor space (use class b1), 3,275 sqm ancillary floor space (use classes a1/a4/c1/sui generis), 154 residential dwellings, improvements to lord derby playing fields/oak plantation and associated landscaping and infrastructure including a dedicated 500kva substation for the residential neighbourhood and a 1000kva substation for the eastern employment area and the demolition of Knowsley lane farm
Outline planning permission for up to 26,350 sqm of employment floor space (use classes B1) and associated landscaping and infrastructure.

Location: Land at, Knowsley lane, Huyton, Knowsley

Notes: An air quality assessment was submitted with the application and reviewed prior to determination of the planning application. The report concludes that the development was not significant with regards to air quality and predicts that the relevant air quality objectives will not be exceeded. The report was approved by the Local Planning Authority and planning permission was granted. As part of development two EV charging points will be installed.

Planning Reference: 18/00269/FUL, Granted: 30 July 18

Proposal: Erection of petrol filling station and cafe, with drive-thru facility and associated works

Location: Academy Business Park, Lees Road, Knowsley industrial park, Kirkby, Knowsley, L33 7SA.

Knowsley Metropolitan Borough Council has identified no other new significant ‘Road Traffic Sources” or other transportation sources in 2018.

C.2 QA/QC of monitoring data

The Kirkby station (no longer operational at Briery Hey Avenue) used Beta Attenuation Monitors (BAM) to monitor particles matter and a nitrogen dioxide analyser. As per TG16 the BAM meets 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.

Data from an analyser is stored on the logger as 'raw' or 'uncorrected' data, therefore data needs to be corrected or 'validated'. To validate data, the NO_2 analyser needs to be checked against a referenced standard of 'zero' air and 'span' gas.
Both Huyton and Halewood sites measure particulate matter using TEOM analysers and nitrogen dioxide analysers.
There are two methods available to correct data by using calibration checks to verify that the analyser is corrected for any response change:

- Daily automatic calibration checks
- Monthly manual calibration checks

The air quality monitoring stations use manual calibration checks

A regular manual calibration is performed at the AQMS on all analysers. For the nitrogen dioxide analyser the check is performed to verify the response of the analyser in reference to the 'zero' and 'span' by introducing a high concentration of NO gas. These results are also used to validate the data for the NOx analyser.

All of the calibration results are then used to create a calibration factor, which is used to correct the data.

Conversion factors for ppb to µg/m3

Conversion rates at 20°C and 101.3kPa:

- NO_2

1.91 x ppb = µg/m^3

Bias adjustment

For this Annual Status Report the local bias adjustment factor was used instead of using the national bias adjustment factor given that we had 12 months' worth of co-location diffusion tube data with the Huyton automatic monitoring site. The local bias adjustment figure is slightly higher than the national figure and therefore will give the worst case scenario. The laboratory was ESG Didcot using 50% TEA in Acetone for the year 2018.

National bias adjustment factor = 0.77

Local bias adjustment figure = 0.79

National bias adjustment figure

National Diffusion Tube Bias Adjustment Factor Spreadsheet — Spreadsheet Version Number: 09/19

Follow the steps below in the correct order to show the results of relevant co-location studies
Data only apply to tubes exposed monthly and are not suitable for correcting individual short-term monitoring periods
Whenever presenting adjusted data, you should state the adjustment factor used and the version of the spreadsheet
This spreadsheet will be updated every few months: the factors may therefore be subject to change. This should not discourage their immediate use.

This spreadsheet will be updated at the end of March 2020
LAQM Helpdesk Website

The LAQM Helpdesk is operated on behalf of Defra and the Devolved Administrations by Bureau Veritas, in conjunction with contract partners AECOM and the National Physical Laboratory.

Spreadsheet maintained by the National Physical Laboratory. Original compiled by Air Quality Consultants Ltd.

Step 1:	Step 2:	Step 3:	Step 4:								
Select the Laboratory that Analyses Your Tubes from the Drop-Down List	Select a Preparation Method from the Drop-Down List	Select a Year from the Drop-Down List	Where there is only one study for a chosen combination, you should use the adjustment factor shown with caution. Where there is more than one study, use the overall factor[3] shown in blue at the foot of the final column.								
If a laboratory is not shown, we have no data for this laboratory.	If a preparation method is not shown, we have no data for this method at this laboratory.	If a year is not shown, we have no data[2]	If you have your own co-location study then see footnote[4]. If uncertain what to do then contact the Local Air Quality Management Helpdesk at LAQMHelpdesk@uk.bureauveritas.com or 0800 0327953								
Analysed By[1]	Method To update your selection, choose (All) from the pop-up list	Year[2] To update your selection, choose (All)	Site Type	Local Authority	Length of Study (months)	Diffusion Tube Mean Conc. (Dm) (µg/m³)	Automatic Monitor Mean Conc. (Cm) (µg/m³)	Bias (B)	Tube Precision[5]	Bias Adjustment Factor (A) (Cm/Dm)	
Socotec Didcot	50% TEA in acetone	2018	R	City of Wolverhampton Council	12	40	28	42.9%	G	0.70	
SOCOTEC Didcot	20% TEA in water	2018		Overall Factor[3] (4 studies)				Use		0.75	
SOCOTEC Didcot	50% TEA in acetone	2018		Overall Factor[3] (30 studies)				Use		0.77	

Local bias adjustment figure

National Diffusion Tube Bias Adjustment Factor Spreadsheet — Spreadsheet Version Number: 09/19

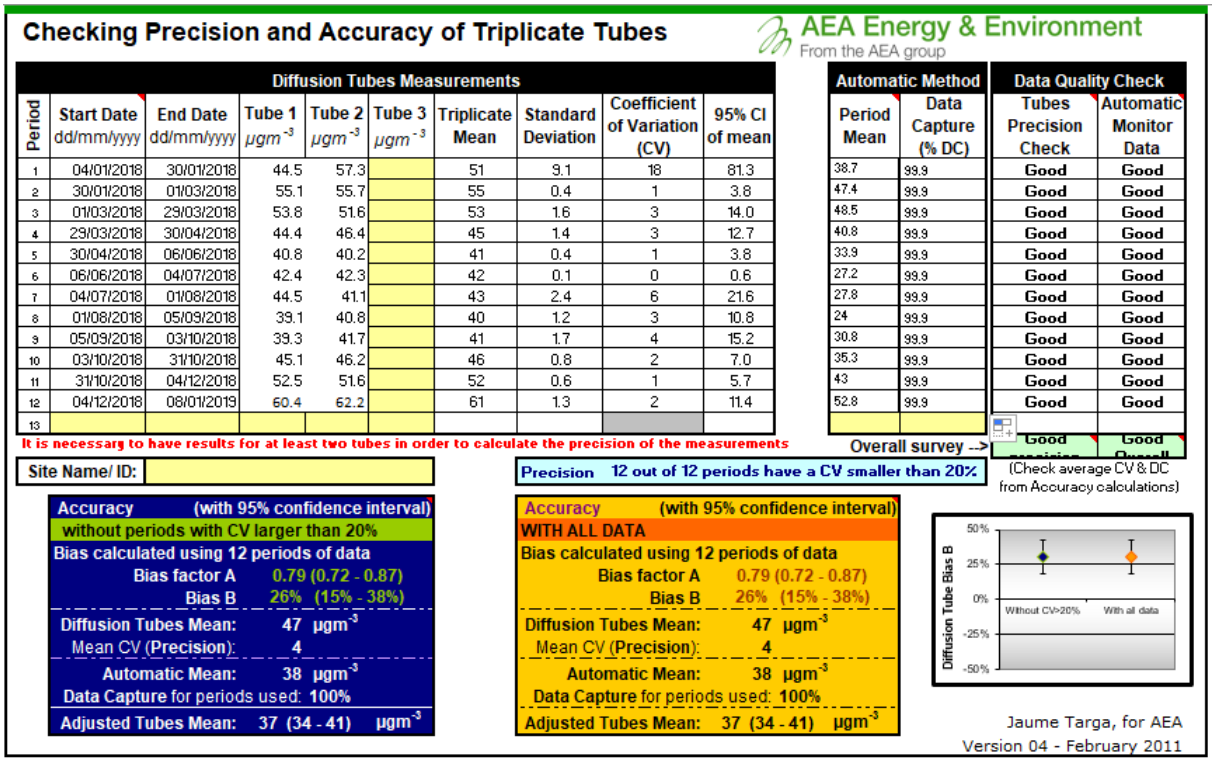
Follow the steps below in the correct order to show the results of relevant co-location studies
Data only apply to tubes exposed monthly and are not suitable for correcting individual short-term monitoring periods
Whenever presenting adjusted data, you should state the adjustment factor used and the version of the spreadsheet
This spreadsheet will be updated every few months: the factors may therefore be subject to change. This should not discourage their immediate use.

This spreadsheet will be updated at the end of March 2020
LAQM Helpdesk Website

The LAQM Helpdesk is operated on behalf of Defra and the Devolved Administrations by Bureau Veritas, in conjunction with contract partners AECOM and the National Physical Laboratory.

Spreadsheet maintained by the National Physical Laboratory. Original compiled by Air Quality Consultants Ltd.

Step 1:	Step 2:	Step 3:	Step 4:								
Select the Laboratory that Analyses Your Tubes from the Drop-Down List	Select a Preparation Method from the Drop-Down List	Select a Year from the Drop-Down List	Where there is only one study for a chosen combination, you should use the adjustment factor shown with caution. Where there is more than one study, use the overall factor[3] shown in blue at the foot of the final column.								
If a laboratory is not shown, we have no data for this laboratory.	If a preparation method is not shown, we have no data for this method at this laboratory.	If a year is not shown, we have no data[2]	If you have your own co-location study then see footnote[4]. If uncertain what to do then contact the Local Air Quality Management Helpdesk at LAQMHelpdesk@uk.bureauveritas.com or 0800 0327953								
Analysed By[1]	Method To update your selection, choose (All) from the pop-up list	Year[2] To update your selection, choose (All)	Site Type	Local Authority	Length of Study (months)	Diffusion Tube Mean Conc. (Dm) (µg/m³)	Automatic Monitor Mean Conc. (Cm) (µg/m³)	Bias (B)	Tube Precision[5]	Bias Adjustment Factor (A) (Cm/Dm)	
Socotec Didcot	50% TEA in acetone	2018	R	Knowsley MBC	12	47	38	26.5%	G	0.79	



Checking Precision and Accuracy of Triplicate Tubes

AEA Energy & Environment
From the AEA group

Diffusion Tubes Measurements

Period	Start Date dd/mm/yyyy	End Date dd/mm/yyyy	Tube 1 µgm^{-3}	Tube 2 µgm^{-3}	Tube 3 µgm^{-3}	Triplicate Mean	Standard Deviation	Coefficient of Variation (CV)	95% CI of mean
1	04/01/2018	30/01/2018	44.5	57.3		51	9.1	18	81.3
2	30/01/2018	01/03/2018	55.1	55.7		55	0.4	1	3.8
3	01/03/2018	29/03/2018	53.8	51.6		53	1.6	3	14.0
4	29/03/2018	30/04/2018	44.4	46.4		45	1.4	3	12.7
5	30/04/2018	06/06/2018	40.8	40.2		41	0.4	1	3.8
6	06/06/2018	04/07/2018	42.4	42.3		42	0.1	0	0.6
7	04/07/2018	01/08/2018	44.5	41.1		43	2.4	6	21.6
8	01/08/2018	05/09/2018	39.1	40.8		40	1.2	3	10.8
9	05/09/2018	03/10/2018	39.3	41.7		41	1.7	4	15.2
10	03/10/2018	31/10/2018	45.1	46.2		46	0.8	2	7.0
11	31/10/2018	04/12/2018	52.5	51.6		52	0.6	1	5.7
12	04/12/2018	08/01/2019	60.4	62.2		61	1.3	2	11.4
13									

Automatic Method		Data Quality Check	
Period Mean	Data Capture (% DC)	Tubes Precision Check	Automatic Monitor Data
38.7	99.9	Good	Good
47.4	99.9	Good	Good
48.5	99.9	Good	Good
40.8	99.9	Good	Good
33.9	99.9	Good	Good
27.2	99.9	Good	Good
27.8	99.9	Good	Good
24	99.9	Good	Good
30.8	99.9	Good	Good
35.3	99.9	Good	Good
43	99.9	Good	Good
52.8	99.9	Good	Good
		Good	Good

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

Overall survey -->

Site Name/ ID:

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

(Check average CV & DC from Accuracy calculations)

Accuracy (with 95% confidence interval)
without periods with CV larger than 20%
Bias calculated using 12 periods of data
Bias factor A 0.79 (0.72 - 0.87)
Bias B 26% (15% - 38%)
Diffusion Tubes Mean: 47 µgm^{-3}
Mean CV (Precision): 4
Automatic Mean: 38 µgm^{-3}
Data Capture for periods used: 100%
Adjusted Tubes Mean: 37 (34 - 41) µgm^{-3}

Accuracy (with 95% confidence interval)
WITH ALL DATA
Bias calculated using 12 periods of data
Bias factor A 0.79 (0.72 - 0.87)
Bias B 26% (15% - 38%)
Diffusion Tubes Mean: 47 µgm^{-3}
Mean CV (Precision): 4
Automatic Mean: 38 µgm^{-3}
Data Capture for periods used: 100%
Adjusted Tubes Mean: 37 (34 - 41) µgm^{-3}

Jaume Targa, for AEA
Version 04 - February 2011

Background levels

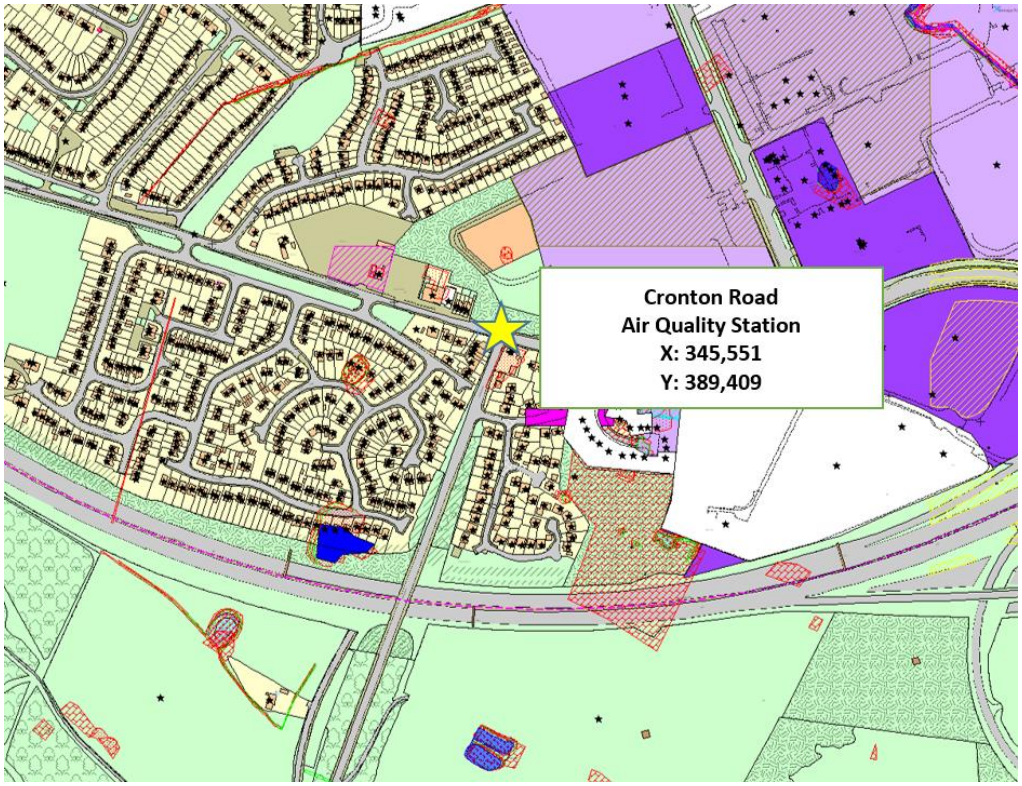
Local annual background mean of NO_2 =19.4 µg/m3 (source: DEFRA: Background Mapping data for local authorities)

Below is the excel pivot table produced from the values obtained from the background mapped data. The relevant value can be extrapolated from the table using the relevant coordinates (see map below)

Pivot Table

Sum of Total_NO2_18	Column La											
Row Labels	339500	340500	341500	342500	343500	344500	345500	346500	347500	348500	349500	350500
384500						18.017	16.907					
385500					16.465	16.475	15.202	13.737	15.581			
386500					15.193	14.644	13.923	13.082	15.404			
387500							13.63	14.448	14.383	13.559		
388500							14.072	16.423	14.159	13.708	13.823	
389500				15.72	17.388	18.599	19.414	22.579	19.313	18.186	17.927	18.486
390500			20.917	20.028	17.565	17.681	17.545	16.995	15.947			
391500				18.585	17.958	17.126	17.435	18.338	19.662			
392500				16.684	17.813	19.781	19.382	17.213	17.863			
393500				15.53	18.737	15.003	14.129	14.339				
394500				15.248	16.736	13.72	12.605	12.3				
395500				16.994	15.782	13.375	12.178	11.697				
396500			20.316	20.14	18.743	14.52	12.947	11.721				
397500	17.00204	18.087	17.103	18.879	16.851	13.732	12.425					
398500	17.539975	17.693	16.736	16.474	17.436	13.333	11.761					
399500		15.212	15.312	14.665	14.604							
400500			13.193									
Grand Total	34.542015	50.992	103.58	188.95	221.27	206.01	223.55	182.87	132.31	45.452	31.749	18.486

Below is a map showing the location of the Huyton AQ station and relevant coordinates.



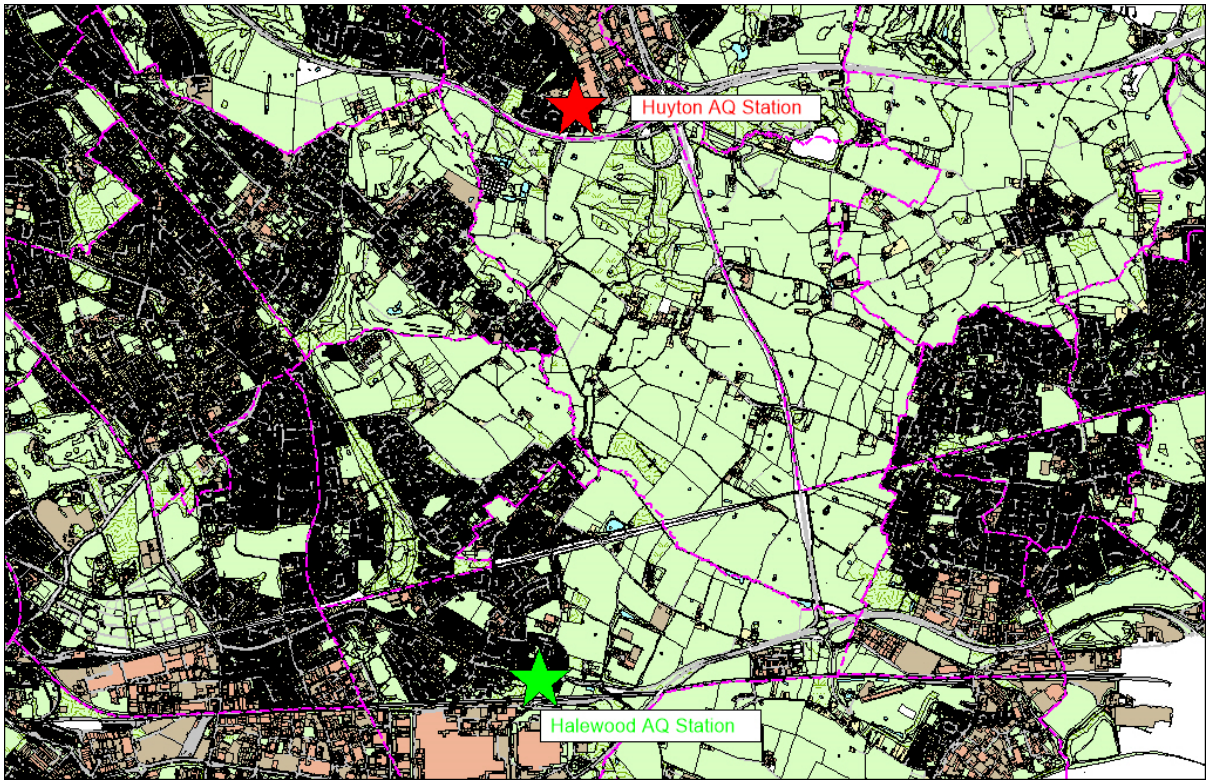
Distance correction.

The results below are from the DEFRA Nitrogen Dioxide fall off with distance calculator (ver. 4.1)

Site Name/ID	Distance (m)		NO_2 Annual Mean Concentration (µg/m^3)		
	Monitoring Site to Kerb	Receptor to Kerb	Background	Monitored at Site	Predicted at Receptor
1	2.0	2.7	19.4	37.5	*36.2*
2	1.3	2.3	19.4	41.0	*38.4*
3	0.7	2.7	19.4	49.3	**41.7**
4	1.6	7.1	19.4	29.8	26.3
5	1.3	2.9	19.4	26.8	25.5
7	1.6	20.4	19.4	36.8	26.9
8	2.5	30.5	19.4	26.6	22.1
9	0.5	5.4	19.4	25.0	22.6
10	1.3	6.7	19.4	23.3	21.9
11	1.3	5.0	19.4	26.4	24.4

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

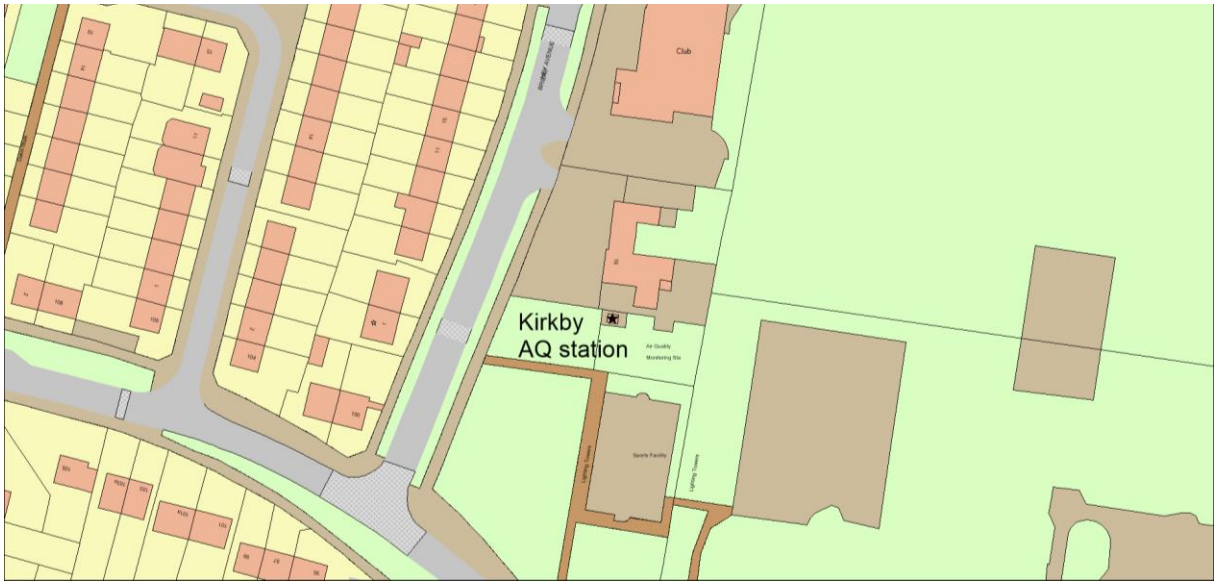
Map 1 – Continuous air quality monitors in the borough of Knowsley.



Map 2- Passive (NO_2 diffusion tube) monitoring sites near M62/M57 motorway junction(west)

Map 3 - Passive monitoring sites near M62/M57 motorway junction (north)

Map 4 – Kirkby automatic monitoring site (Briery Hey Avenue) – No longer active



Map 5 – Huyton automatic monitoring site (Cronton Road)

Map 6 – Halewood automatic monitoring site (Higher Road)

Appendix E: Summary of Air Quality Objectives in England

Table E.1 – Air Quality Objectives in England

Pollutant	Air Quality Objective[4]	
	Concentration	Measured as
Nitrogen Dioxide (NO_2)	200 µg/m^3 not to be exceeded more than 18 times a year	1-hour mean
	40 µg/m^3	Annual mean
Particulate Matter (PM_{10})	50 µg/m^3, not to be exceeded more than 35 times a year	24-hour mean
	40 µg/m^3	Annual mean
Sulphur Dioxide (SO_2)	350 µg/m^3, not to be exceeded more than 24 times a year	1-hour mean
	125 µg/m^3, not to be exceeded more than 3 times a year	24-hour mean
	266 µg/m^3, not to be exceeded more than 35 times a year	15-minute mean

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

Glossary of Terms

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

References

- AECOM (2018) Liverpool City Region Preliminary Air Quality Options Study
- DEFRA (2016) Local Air Quality Management, Technical Guidance LAQM. TG(16)
- Knowsley Council (2016) Joint Strategic Needs Assessment Report (Environment)
- Liverpool City Region Combined Authority (2015) Sustainable Transport Enhancements Package (STEP).
- Public Health England, Public Health Outcomes Framework (PHOF)