The London Borough of Merton Air Quality Annual Status Report for 2022

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This report provides a detailed overview of air quality in the London Borough of Merton during 2022. It has been produced to meet the requirements of the London Local Air Quality Management (LLAQM) statutory process[1].

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[1] LLAQM Policy and Technical Guidance 2019 (LLAQM.TG(19))

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Abbreviations

Abbreviation	Description
AQAP	Air Quality Action Plan
AQMA	Air Quality Management Area
AQO	Air Quality Objective
BEB	Buildings Emission Benchmark
CAB	Cleaner Air Borough
EV	Electric Vehicle
GLA	Greater London Authority
LAEI	London Atmospheric Emissions Inventory
LAQM	Local Air Quality Management
LLAQM	London Local Air Quality Management
NRMM	Non-Road Mobile Machinery
PM_{10}	Particulate matter less than 10 micron in diameter
$PM_{2.5}$	Particulate matter less than 2.5 micron in diameter
TEB	Transport Emissions Benchmark
TfL	Transport for London

Table A. Summary of National Air Quality Standards and Objectives

Pollutant	Standard / Objective (UK)	Averaging Period	Date[(1)]
Nitrogen dioxide (NO_2)	200 µg m^{-3} not to be exceeded more than 18 times a year	1-hour mean	31 Dec 2005
Nitrogen dioxide (NO_2)	40 µg m^{-3}	Annual mean	31 Dec 2005
Particles (PM_{10})	50 µg m^{-3} not to be exceeded more than 35 times a year	24-hour mean	31 Dec 2004
Particles (PM_{10})	40 µg m^{-3}	Annual mean	31 Dec 2004
Particles ($PM_{2.5}$)	20 µg m^{-3}	Annual mean	2020
Particles ($PM_{2.5}$)	Target of 15% reduction in concentration at urban background locations	3-year mean	Between 2010 and 2021
Sulphur dioxide (SO_2)	266 µg m^{-3} not to be exceeded more than 35 times a year	15-minute mean	31 Dec 2005
Sulphur dioxide (SO_2)	350 µg m^{-3} not to be exceeded more than 24 times a year	1-hour mean	31 Dec 2004
Sulphur dioxide (SO_2)	125 µg m^{-3} mot to be exceeded more than 3 times a year	24-hour mean	31 Dec 2004

Notes:

(1) Date by which to be achieved by and maintained thereafter

Pollutant	UK Standard / Air Quality Objective (µgm^{-3})	WHO guideline (µgm^{-3})	Averaging period
PM_{10} particulate matter	40	15	Annual
$PM_{2.5}$ particulate matter	25	5	Annual
Nitrogen dioxide	40	10	Annual

1. Air Quality Monitoring

Air quality is a complex area of science with many variables to be considered. Monitoring needs to be carried out over an extended period of time in order to show real-world trends. It is affected by, temperature, weather, geography/local conditions and wind direction. It is not necessarily accurate to compare one year's data with the next without considering all the variable factors. However, this does provide an 'indication' of local changes.

The latest monitoring results for 2022 confirm that air pollution in the Merton still exceeds the National Air Quality objectives in some locations, almost entirely along main roads and associated with traffic and therefore there is still a need for Merton to be designated as an Air Quality Management Area and to pursue improvements in air quality. Merton also recognise the possibility of stricter objectives following changes to the World Health Organisation Guidelines on 22nd September 2021.

There are two pollutants we are legally required to measure at this time, these are, nitrogen dioxide (NO_2) and particulate matter (PM_{10}). NO_2 is almost entirely linked to combustion and a reliable indicator of pollution arising from traffic, this is because it is generally not naturally occurring outside lightning strikes. Particulate matter, however, exists throughout the environment with many incidents or episodes of pollution being caused nationally or globally.

There are two automatic monitoring stations located in Merton, an NO_2 analyser at the Civic Centre in Morden (ME9) and the second, a particulate matter (PM_{10}) analyser on Merton Road in South Wimbledon (ME2). These stations are expensive to install and maintain and so using them at multiple locations is cost prohibitive, they produce accurate, real-time data that feed into the London Air Quality Network (LAQN) and can be viewed on the LondonAir website. All data undergoes quality assurance and quality control (QA/QC) procedures to ensure that it is of a high quality. The standards of QA/QC at LAQN sites are similar to those of the Government's national Automatic Urban and Rural Network (AURN) sites. All data has traceability to national standards and operational procedures are defined for the LAQN. For quality assurance purposes, all continuous analysers are manually checked

and calibrated every two weeks, serviced every six months and audited by an independent auditor the National Physical Laboratory (NPL) every six months. Data management and ratification is undertaken by the Environmental research Group (ERG) at Imperial College London.

Merton Council also undertakes non-automatic monitoring of nitrogen dioxide (NO_2) using diffusion tubes, in 2022 61 locations were monitored. Diffusion tubes provides a comprehensive coverage of all hotspots including most main roads and town centres throughout the borough. All sites are kept under constant review with changes taking effect in January annually. Diffusion tubes offer a relatively inexpensive means of gauging NO_2 concentrations at multiple locations across the borough. The results provide monthly NO_2 averages and can be used to compare measured concentrations with the annual mean NO_2 objective following annualisation. The accuracy of diffusion tube data is improved by comparing results with automatic monitoring data and applying a bias adjustment factor which is calculated by the National Physical Laboratory (NPL).

1.1 Locations

Table B. Details of Automatic Monitoring Sites for 2022

Site ID	Site Name	X (m)	Y (m)	Site Type	In AQMA? If so, which AQMA?	Distance to Relevant Exposure (m)	Distance to Kerb of Nearest Road (N/A if not applicable) (m)	Inlet height (m)	Pollutants monitored	Monitoring technique
ME2	Merton Road, South Wimbledon	525808	170122	Roadside	Y	3	0.6	1.6	PM_{10}	BAM
ME9	Civic Centre, Morden	525588	168498	Roadside	Y	0.6	3.0	2.5	NO_2	Chemilumine scent

Table C. Details of Non-Automatic Monitoring Sites for 2022

Site ID	Site Name	X (m)	Y (m)	Site Type	In AQMA? If so, which AQMA?	Distance to Relevant Exposure (m)	Distance to Kerb of Nearest Road (N/A if not applicable) (m)	Inlet height (m)	Pollutants monitored	Tube co-located with an automatic monitor. (Y/N)
1	Bushey Road (A289) near Bushey Court, SW20 0JE	523139	169056	Roadside	Y	15.3	1.5	2.5	NO_2	N
2 (GA)	Stonecot Hill, SM3 9HJ	524489	166637	Roadside	Y	12.2	1.7	2.4	NO_2	N
4 (FA)	154 Grand Drive, Raynes Park	523315	168048	Kerbside	Y	3.6	0.9	2.4	NO_2	N
5 (BA)	Sacred Heart Primary School, Burlington Road, New Malden,	522501	168235	Kerbside	Y	7.9	0.7	2.4	NO_2	N
6 (JC)	17 Grand Drive, Raynes Park, SW20 0JB	523207	169195	Kerbside	Y	8.4	0.3	2.4	NO_2	N

7	Kingston Road (A298), SW20 8LX	524401	169351	Roadside	Y	8.3	1.5	2.4	NO_2	N
8	Coombe Lane (A238), SW20 8NF	523246	169333	Kerbside	Y	2	0.6	2.2	NO_2	N
9	12 Lambton Road, Cottenham Park, Raynes Park, SW20 0LR	523202	169374	Kerbside	Y	3.6	0.5	2.2	NO_2	N
11	Kingston Road SW20 1JW	525602	170042	Kerbside	Y	3.4	0.4	2.4	NO_2	N
13	Cottenham Park Road (B281), SW20 0RX	523181	170264	Kerbside	Y	12.4	0.6	2.2	NO_2	N
14 (AC)	20 The Ridgeway, Wimbledon, SW19 4SB	524111	170879	Kerbside	Y	1.5	0.4	2.4	NO_2	N
16	84 High Street, Wimbledon	524067	171074	Kerbside	Y	2.9	0.6	2.2	NO_2	N

	Village, SW19 7QU									
18	25-27 Wimbledon Hill, SW19 7NE	524696	170725	Kerbside	Y	2.6	0.3	2.4	NO_2	N
19	Wimbledon Station, SW19 7NW	524770	170645	Roadside	Y	3.6	2.5	2.4	NO_2	N
20	Hartfield Road, Wimbledon, SW19 3TA	524867	170500	Kerbside	Y	4.8	0.4	2.2	NO_2	N
21 (EA)	246 Merton Road (A219), South Wimbledon SW19 1AU	525798	170081	Roadside	Y	1.9	0.5	2.4	NO_2	N
22	12-16 Upper Green West, CR4 3AA	527756	168993	Roadside	Y	4.2	2	2.4	NO_2	N
23	183 Kingston Road, SW19 1LH	525156	169935	Kerbside	Y	1.9	0.6	2.2	NO_2	N
24	75 Hartfield Road SW19 3TJ	524994	170329	Kerbside	Y	4.1	0.7	2.4	NO_2	N

25	Alexandra Road, SW19 7LE	525104	171125	Roadside	Y	4	2.1	2.2	NO_2	N
26	Gap Road, SW19 8JG	525708	171413	Roadside	Y	5.1	2.3	2.2	NO_2	N
27	Plough Lane, SW19 8BS	526035	171472	Roadside	Y	6.5	2.3	2.2	NO_2	N
28 (BC)	11 Haydons Road SW19 1HG	526158	170167	Roadside	Y	5.9	2.4	2.4	NO_2	N
29 (HA)	44 High Street (A24), Colliers Wood, SW19 2BN	526792	170376	Kerbside	Y	2.6	0.7	2.4	NO_2	N
30	Christchurch Road (A24), SW19 2NZ	526791	170087	Roadside	Y	3	0.3	2.4	NO_2	N
31 (LA)	Alley Charminster Avenue, Morden, SW19 3EL	525452	169137	Background	Y	9	15	2.4	NO_2	N
32	Merantum Way, SW19 2JY	526138	169825	Kerbside	Y	4.8	0.8	2.4	NO_2	N

33	Morden Road (A24), SW19 3BP	525803	169467	Roadside	Y	3.6	2.7	2.2	NO_2	N
34 (GC)	Western Road, Colliers Wood, SW19 2QD	526840	169694	Roadside	Y	2.3	2	2.2	NO_2	N
35 (MA)	Lavender Avenue, Morden, CR4 3HS	527621	169646	Kerbside	Y	5.8	0.4	2.2	NO_2	N
36 (DC)	35 London Road, Tooting, SW17 9HP	527915	170518	Roadside	Y	1.9	1.5	2.4	NO_2	N
37 (CC)	107 London Road, Tooting, CR4 2JA	527935	169502	Kerbside	Y	2.4	0.6	2.4	NO_2	N
38 (EC)	265 London Road, Mitcham, CR4 3UA	527738	168863	Kerbside	Y	4.2	0.6	2.4	NO_2	N
39 (FC)	Church Road, Mitcham, CR4 3BU	527158	168646	Kerbside	Y	3	0.6	2.4	NO_2	N

40	London Road (A217), CR4 4BF	527370	168312	Kerbside	Y	5.4	0.8	2.4	NO_2	N
41	Morden Road (A239), SM4 6AU	526395	168172	Roadside	Y	3.1	1.5	2.4	NO_2	N
42	St Hellier Road, SM4 6JE	526210	167683	Roadside	Y	12.8	3.3	2.4	NO_2	N
43	Morden Hall Road near junction, SM4 5JG	526151	168293	Roadside	Y	22.2	2.4	2.3	NO_2	N
44 (AA)	31 London Road, Morden, SM4 5DN	525817	168643	Kerbside	Y	4.9	0.6	2.4	NO_2	N
45 (IC)	HSBC, London Road Morden	525778	169824	Kerbside	Y	2.6	0.9	2.4	NO_2	N
46 (HC)	11 Crown Lane, Morden, SM4 5BY	525435	168499	Kerbside	Y	5	0.6	2.4	NO_2	N
47	Civic Centre, Morden, SM4 5HP	525588	168498	Roadside	Y	1.5	1.5	2.4	NO_2	Y

48	Aberconway Road, SM4 5LF	525757	168509	Roadside	Y	7.7	1.2	2.4	NO_2	N
49	Crown Road Junction with Stanley Rd, Morden	525500	168470	Kerbside	Y	2.9	0.8	2.4	NO_2	N
50	Martin Way, Morden, SM4 4AR	524638	168616	Kerbside	Y	9.7	0.7	2.4	NO_2	N
51	Streatham Rd (A24) near Sandy Lane/Gorringe Park School, CR4 2AH	528219	169782	Roadside	Y	5.2	1.6	2.4	NO_2	N
52	West Barnes Lane near level crossing, KT3 6HP	522749	168500	Kerbside	Y	1.4	0.6	2.4	NO_2	N
53	139 Epsom Road (A24), near traffic lights, SM3 9EY	524621	166786	Kerbside	Y	3.6	0.7	2.4	NO_2	N
54	43 Upper Green East, Mitcham, CR4 2PF	527890	168920	Roadside	Y	2.0	2.4	2.3	NO_2	N

55	213 Manor Road, Mitcham, CR4 1JH	529661	168839	Kerbside	Y	5.2	0.6	2.2	NO_2	N
56	1 Weir Road, Wimbledon, SW19 8UX	525875	171682	Roadside	Y	13	1.5	2.3	NO_2	N
57	363 Durnsford Road, Wimbledon, SW19 8EF	525396	172558	Roadside	Y	5.0	2.4	1.9	NO_2	N
S01	Abbey Childrens Centre/Merton Abbey Primary School (High Path)	525941	169866	Roadside	Y	8.3	1.2	2.3	NO_2	N
S4B	All Saints C of E Primary School (Haydon Road)	526136	170328	Roadside	Y	3.4	0.7	2.3	NO_2	N
S12	St. Peter & St. Paul Catholic Primary School	527639	168363	Roadside	Y	52.9	2.0	2.3	NO_2	N
S36B	Park Community	525815	169235	Roadside	Y	12.0	2.7	2.3	NO_2	N

	School, Merton Road									
S51	Morden Primary School	525093	167325	Roadside	Y	6.10	3.5	2.25	NO_2	N
S63	Wimbledon High School, Wimbledon Hill	524505	170891	Roadside	Y	18.1	3.3	2.15	NO_2	N
S67	Rise Education, Western Road	527552	169099	Roadside	Y	6.10	1.8	2.3	NO_2	N
S68	Eagle House School, London Road	527831	169253	Roadside	Y	18.1	0.65	2.3	NO_2	N
S69	Just Learn, Commonside West	527947	168855	Roadside	Y	14.3	2.2	2.3	NO_2	N

1.2 Comparison of Monitoring Results with AQOs

The results presented are after adjustment using the national bias adjustment factor (refer to Appendix A2 for details). Annualisation was required at one site in the main Merton diffusion network in 2022, all other sites achieved a data capture rate of 75% or higher.

Where the annual mean is 10% of, or above, the 40μg m^{-3} Air Quality Objective (AQO) relevant exposure has been calculated, refer to Table N, Appendix A3 for corrected data. Data presented in Table D have **not** been corrected for distance to allow direct comparison of data over time and as such presents a worst-case picture.

Any ID's from 2016 or earlier are in brackets. Full site descriptions and the 2022 monitoring data for the revised network are provided in Table C.

Table D. Annual Mean NO_2 Ratified and Bias-adjusted Monitoring Results

Site ID	Site type	Valid data capture for monitoring period %[a]	Valid data capture 2022 %[b]	2016	2017	2018	2019	2020	2021	2022
ME9	RS Automatic	69	69	Faulty	Faulty	**48**	**51**	**41(43)**	Insufficient valid results available for this year.	34 (38.3)
1	RS DT	92	92	not open	**52**	**48**	**47**	34	36	36
2 (GA)	RS DT	92	92	32	**41**	37	36	27	30	25
4 (FA)	KS DT	100	100	39	37	30	30	27	28	26
5 (BA)	KS DT	92	92	32	**42**	38	33	27	29	27
6 (JC)	KS DT	92	92	34	**45**	**43**	**43**	33	35	34
7	RS DT	100	100	not open	**44**	**46**	**41**	33	34	32
8	KS DT	92	92	not open	**53**	**43**	**46**	38	38	34

Site ID	Site type	Valid data capture for monitoring period %[a]	Valid data capture 2022 %[b]	2016	2017	2018	2019	2020	2021	2022
9	KS DT	100	100	not open	43	47	43	37	35	31
11	KS DT	100	100	not open	35	35	34	28	28	26
13	KS DT	100	100	not open	44	37	35	23	24	20
14 (AC)	KS DT	100	100	45	44	42	44	27	28	25
16	KS DT	83	83	not open	39	45	45	33	36	31
18	KS DT	100	100	not open	64	66	65	57	58	52
19	RS DT	100	100	not open	52	55	51	40	40	38
20	KS DT	75	75	not open	48	55	52	39	47	40
21 (EA)	KS DT	100	100	61	57	69	63	52	59	51
22	RS DT	100	100	not open	77	64	57	47	44	45
23	KS DT	100	100	not open	61	58	55	49	46	42
24	KS DT	100	100	not open	38	39	32	31	29	28
25	RS DT	92	92	not open	41	39	40	32	34	28
26	RS DT	92	92	not open	47	45	45	34	35	29
27	RS DT	92	92	not open	46	46	42	32	32	32
28 (BC)	RS DT	100	100	54	46	49	43	33	31	28
29 (HA)	KS DT	100	100	50	61	66	60	45	46	41
30	KS DT	100	100	not open	48	51	51	35	36	33
31 (LA)	BG DT	92	92	24	20	21	20	15	15	14
32	KS DT	100	100	not open	42	38	35	29	29	25
33	RS DT	92	92	not open	49	48	47	34	37	32
34(GC)	RS DT	100	100	64	59	55	54	43	41	39
35 (MA)	KS DT	92	92	39	31	31	29	25	24	21
36 (DC)	RS DT	100	100	57	42	47	40	33	34	31
37 (CC)	KS DT	100	100	62	61	67	56	41	44	42
38 (EC)	KS DT	92	92	39	41	44	41	33	35	33
39 (FC)	KS DT	100	100	41	45	48	40	30	30	26
40	KS DT	100	100	not open	46	52	41	33	33	33
41	RS DT	100	100	not open	41	48	45	41	40	30
42	RS DT	100	100	not open	35	38	42	34	38	33
43	RS DT	100	100	not open	44	50	45	36	39	36
44 (AA)	KS DT	92	92	38	57	62	62	51	54	52

Site ID	Site type	Valid data capture for monitoring period %[a]	Valid data capture 2022 %[b]	2016	2017	2018	2019	2020	2021	2022
45 (IC)	KS DT	92	92	**45**	**45**	**48**	**48**	**43**	38	33
46 (HC)	KS DT	92	92	**48**	**61**	**53**	**49**	**42**	40	38
47	RS DT	92	92	not open	**51**	**51**	**52**	**44**	**42**	37
48	RS DT	92	92	not open	**41**	**42**	39	31	31	28
49	KS DT	100	100	not open	39	**40**	39	30	30	27
50	KS DT	83	83	not open	**45**	**43**	**40**	31	33	29
51	RS DT	67	67	not open	not open	38	33	26	30	33
52	KS DT	92	92	not open	not open	35	30	25	25	23
53	KS DT	83	83	not open	not open	**43**	**51**	**41**	**48**	**41**
54	RS DT	92	92	not open	not open	not open	**62**	**47**	**49**	**45**
55	KS DT	92	92	not open	not open	not open	**45**	36	37	36
56	RS DT	100	100	not open	not open	not open	not open	not open	not open	22
57	RS DT	100	100	not open	not open	not open	not open	not open	not open	23
S01	RS DT	100	100	not open	not open	not open	26	18	20	18
S4B	RS DT	92	92	not open	not open	not open	**46**	31	30	27
S12	RS DT	83	83	not open	not open	not open	**38**	30	34	33
S36B	RS DT	100	100	not open	not open	not open	**39**	32	35	33
S51	RS DT	100	100	not open	not open	not open	**42**	29	37	31
S63	RS DT	100	100	not open	not open	not open	**56**	34	33	31
S67	RS DT	100	100	not open	not open	not open	**43**	29	33	32
S68	RS DT	100	100	not open	not open	not open	**53**	35	**40**	39
S69	RS DT	100	100	not open	not open	not open	**43**	30	36	33

Notes:

The annual mean concentrations are presented as µg m^{-3}.

Exceedances of the NO_2 annual mean AQO of 40 µg m^{-3} are shown in **bold**.

NO_2 annual means in excess of 60 µg m^{-3}, indicating a potential exceedance of the NO_2 hourly mean AQS objective are shown in **bold and underlined**.

Means for diffusion tubes have been corrected for bias.

All means have been “annualised” in accordance with LLAQM Technical Guidance if valid data capture for the calendar year is less than 75% and greater than 25%.

Results have been distance corrected where applicable.

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

(b) data capture for the full calendar year (e.g. if monitoring was carried out for six months the maximum data capture for the full calendar year would be 50%).

Notes about the data:

Table D presents the annual mean nitrogen dioxide concentrations measured at the automatic monitoring site ME9 and 61 diffusion tube monitoring locations. All data has undergone quality control and quality assurance procedures as required, these processes are reported in Appendix A. Raw, uncorrected monthly diffusion tube data for 2022 is presented in Table O.

Automatic Monitoring

Prior to 11th October 2017 continuous monitoring of nitrogen dioxide was measured by instrument ME1. The roadside site was located at Morden Civic Centre and suffered a series of faults during 2016, no data is available for 2016 and 2017 for this reason. A new chemiluminescent NO_2 analyser was installed on the 11th October 2017 identified as ME9.

At the time of writing, all automatic monitoring data have been fully ratified, annualisation was required as the data capture rate was below 75%. Where data capture is below 75% no firm conclusions can be drawn as results may not be representative of the full year and should be used for guidance only. The annualisation process is provided in Appendix A3, Table M. In 2022 there were challenges maintaining equipment and sourcing technical components and calibration gases. There has been considerable resourcing allocated to refreshing the network in 2023, which will include $PM_{2.5}$ monitoring.

Automatic nitrogen dioxide analysers produce a continuous stream of data which can be used to calculate the long term, annual objective as reported in Table D and also the short term annual objective as reported in Table E.

Diffusion Tube Monitoring

Data capture at a single diffusion tube monitoring location fell below 75% and required annualisation. The annualisation process is provided in Appendix A3, Table M.

Diffusion tube data have been bias adjusted using the national bias adjustment factor and annualised where the data capture rate was below 75%. The data correction process is included in **Error! Reference source not found.**).

The distance correction calculations for diffusion tube monitoring sites that exceeded the annual mean objective are presented in Appendix A3, Table N. Nitrogen dioxide

concentration reduces rapidly with distance from the kerbside, the data in Table N shows what a substantial effect distance has on a roadside / kerbside measurement. After correcting for distance, 2 sites out of 61 were still predicted to be at or above the annual mean AQO at the nearest sensitive receptor.

Nitrogen dioxide (NO_2) Trend Analysis

In 2022, NO_2 was continuously monitored at a single location and across an extensive diffusion tube network consisting of 61 monitoring locations. The original diffusion tube network of 20 monitoring locations was incorporated into the 2017 revised network to help assess trends over time. For London boroughs, as per LLAQM.TG(19) paragraph 3.10, current guidance states that the last four years of monitoring data should be considered, and a trend analysis undertaken to identify any significant changes. Over the last four years nitrogen dioxide concentrations have overall decreased across Merton.

The results from the 2022 monitoring (Table D) show that the objective of 40 μgm^{-3} was exceeded at 9 monitored locations in the borough which is 15% of sites, a visual overview of compliance is provided in Figure 1. However, once the sites exceeding were corrected for distance (Appendix A3, Table N) to provide an indication of the concentration at relevant exposure (sensitive receptor), 2 sites were found to be at or above the objective. The two locations exceeding the air quality objective were Site ID 22, Upper Green West at 40.7 μgm^{-3}) and Site ID 54, Upper Green East at 40.0 μgm^{-3}.

Since 2019, no diffusion tube monitoring location has exceeded an annual mean of 60 μgm^{-3} indicating that the 1 hour-mean objective is likely to have been achieved across the borough and in all town centres, marking a significant improvement in air quality.

Data from active sites from the original diffusion tube network between 2017-2022 have been charted in Figure 2 across 4 charts, the locations have been grouped geographically to aid comparison.

The impact of COVID-19 manifested in a steep drop in NO_2 at all monitoring locations in 2020 and while concentrations did rebound slightly in 2021 concentrations in 2022 have largely returned to or fallen below 2020 levels which is encouraging. **Currently no location monitored in the borough would meet the new WHO guideline value**

of 10 µgm^{-3} (annual mean) set to protect the public from the health effects of gaseous nitrogen dioxide.

The main source of pollution in the borough remains road traffic, the updated London Atmospheric Inventory (LAEI 2019) released in 2022 estimates 60% of nitrogen oxide emissions originate from road transport, followed by industrial/commercial heat and power 20%, and domestic heat and power 12%.

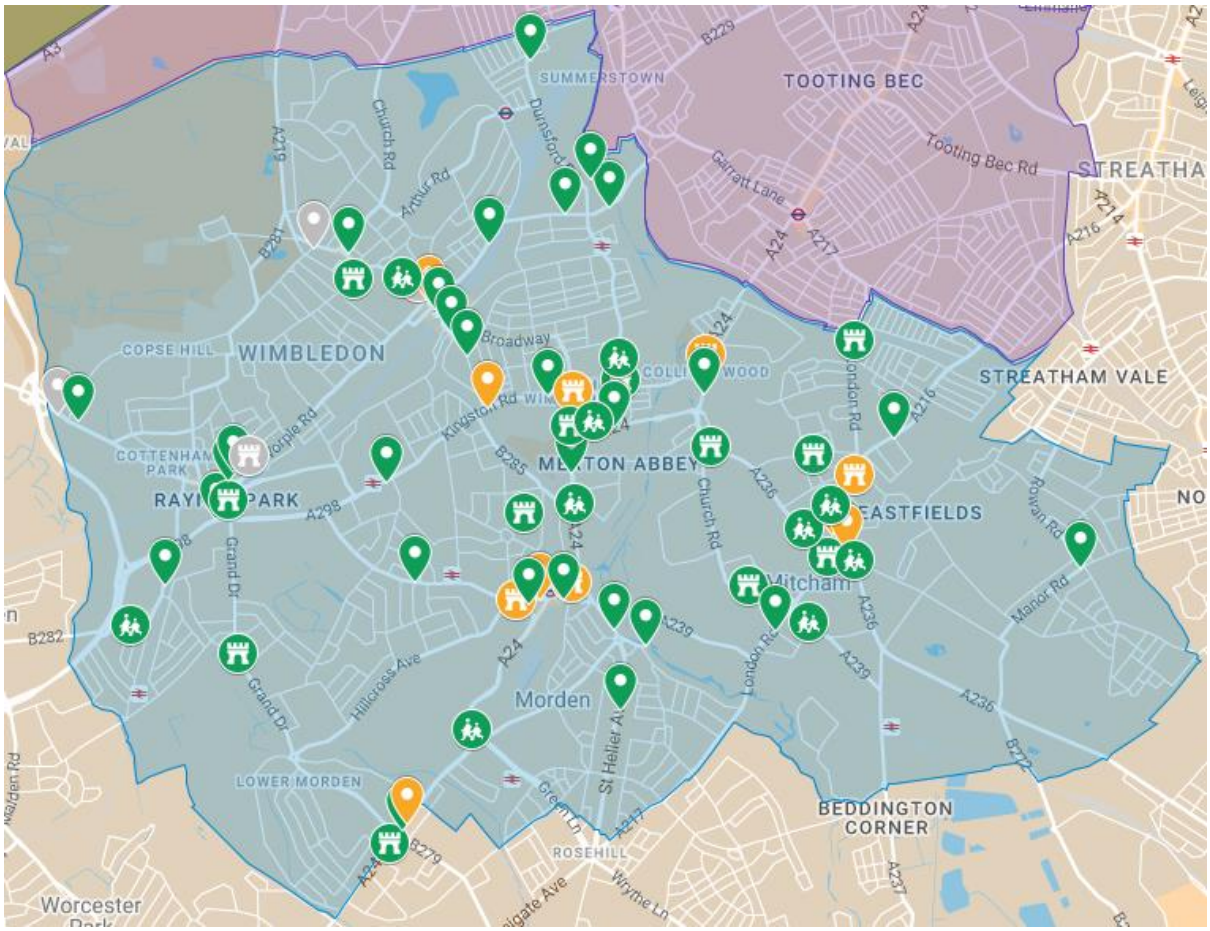
As road transport is the largest contributor to NO_2 emissions, many factors at all levels of central and local government have contributed to the reduction in emissions that we are observing. Recent 2020 – 23, Euro 6 diesel cars and light vehicles are delivering improvements on the earlier Euro 6 versions, which on real world driving cycles really are cleaner. The announcement by government to move forward a ban on the sale of pure internal combustion engine cars from 2040 to 2030 appears to have helped. According to the SMMT (Society of Motor manufacturers and Traders) although 2022 witnessed a drop in new vehicle registrations, it saw an increase in sales of electric vehicles, plug-ins and hybrids, which totalled approximately a third of all new vehicle sales in 2022, whilst diesel sales continued to fall.

There are a number of Air Quality Action Plan measures that are directly linked to reducing road transport emissions and progress against these are reported in Table J. In summary:

- More residents are switching to electric or hybrid.
- The introduction of new school streets.
- Encouragement for modal shift away from the private car onto bikes, cargo bikes, walking and public transport.
- Even in outer London where public transport cannot compete with central London, planning applications are assessed and encouraged, where realistic, to be car free. Electric vehicle charge points (EVCP's) are conditioned in all possible planning applications and are being rolled out borough wide.
- Lastly, idling is a priority in Merton. Targeted monthly awareness events are delivered which are increasing driver awareness and behaviour change away from engine idling.

The overall monitoring results for the Borough in 2022 are positive and show significant improvements toward borough wide compliance with the UK Air Quality Objective (AQO) for nitrogen dioxide and we will continue to strive to achieve this as soon as possible. Reductions beyond UK AQO are welcome, since the more we know and understand about harm to health associated with air pollution, the more we want to aim for achieving the more stringent voluntary WHO levels set out in September 2021. This will require a step change in the way we live our lives, travel and heat our homes.

Figure 1: London Borough of Merton mapped 2022 NO_2 concentrations



Legend

Compliant sites: Annual mean NO_2 below 40 μgm^{-3}

Original network site from 2012

Network refresh site from 2017

Schools site

Non-compliant site: Annual mean NO_2 above 40 μgm^{-3} but below 60 μgm^{-3}

Original network site from 2012

Network refresh site from 2017

Closed site: Air Quality Objectives met over a number of years and monitoring site relocated

Original network site from 2012

Network refresh site from 2017

Figure 2: Long term NO_2 concentration trends in Merton 2012-2022 (all data bias adjusted). *Presented in the following 4 charts by area.*

Chart 1 of 4: Raynes Park / New Malden / Wimbledon

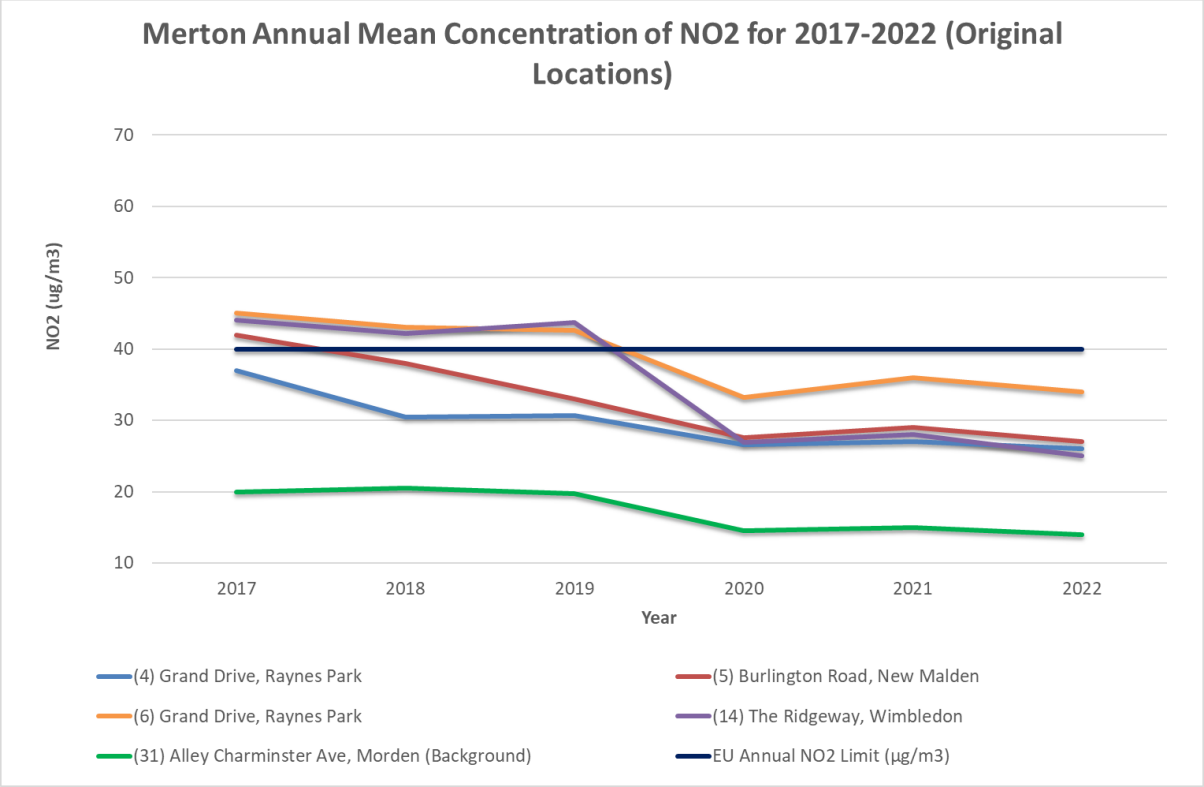


Chart 2 of 4: South Wimbledon / Colliers Wood / Tooting

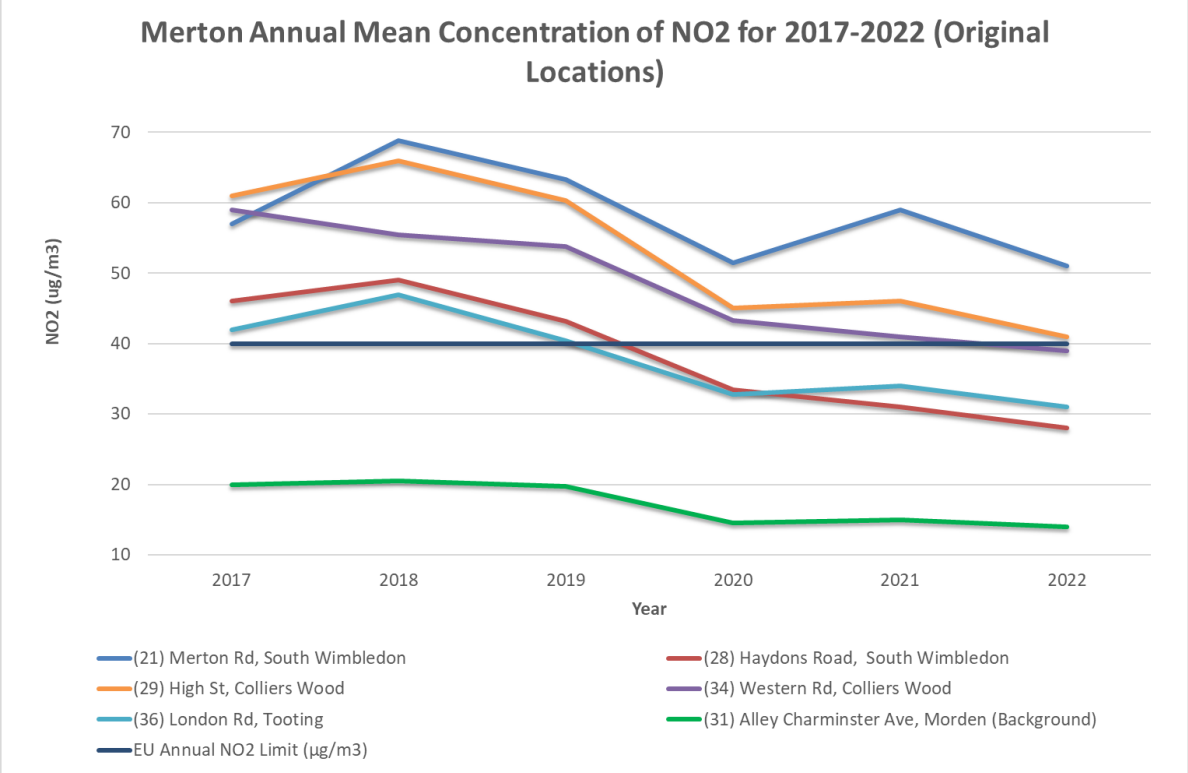


Chart 3 of 4: Mitcham

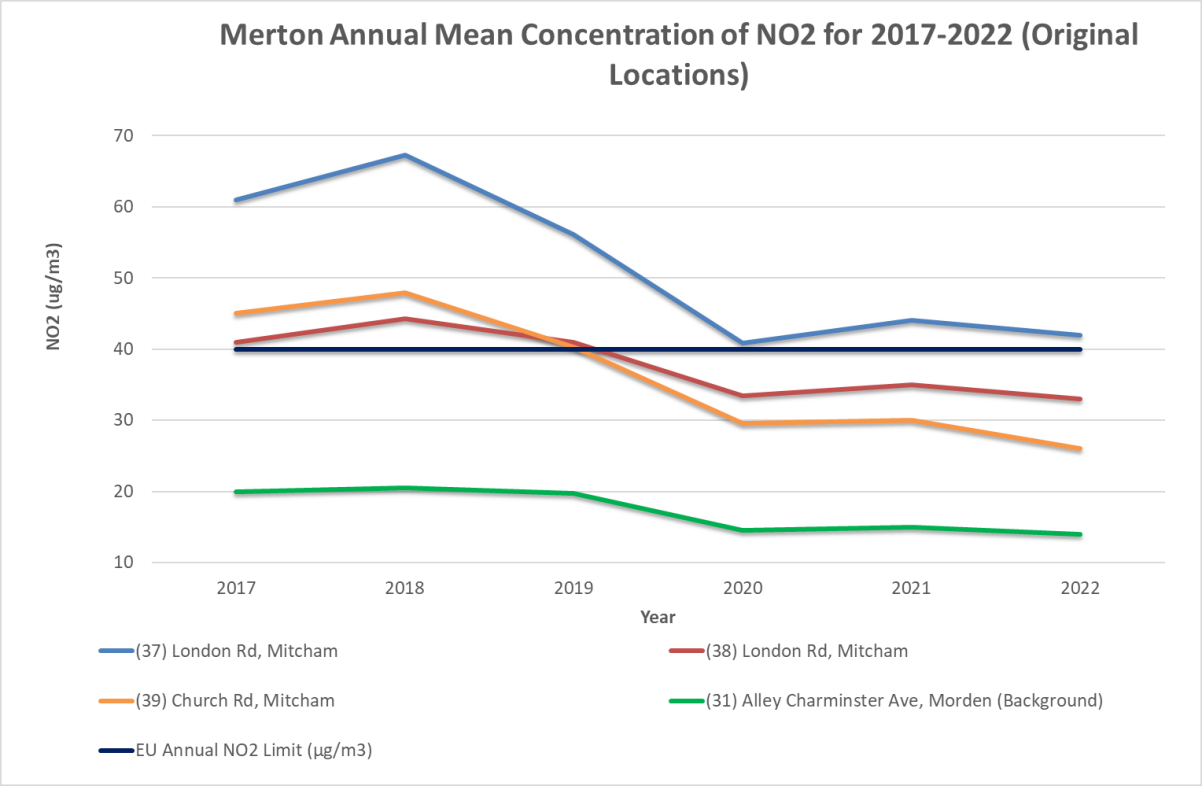
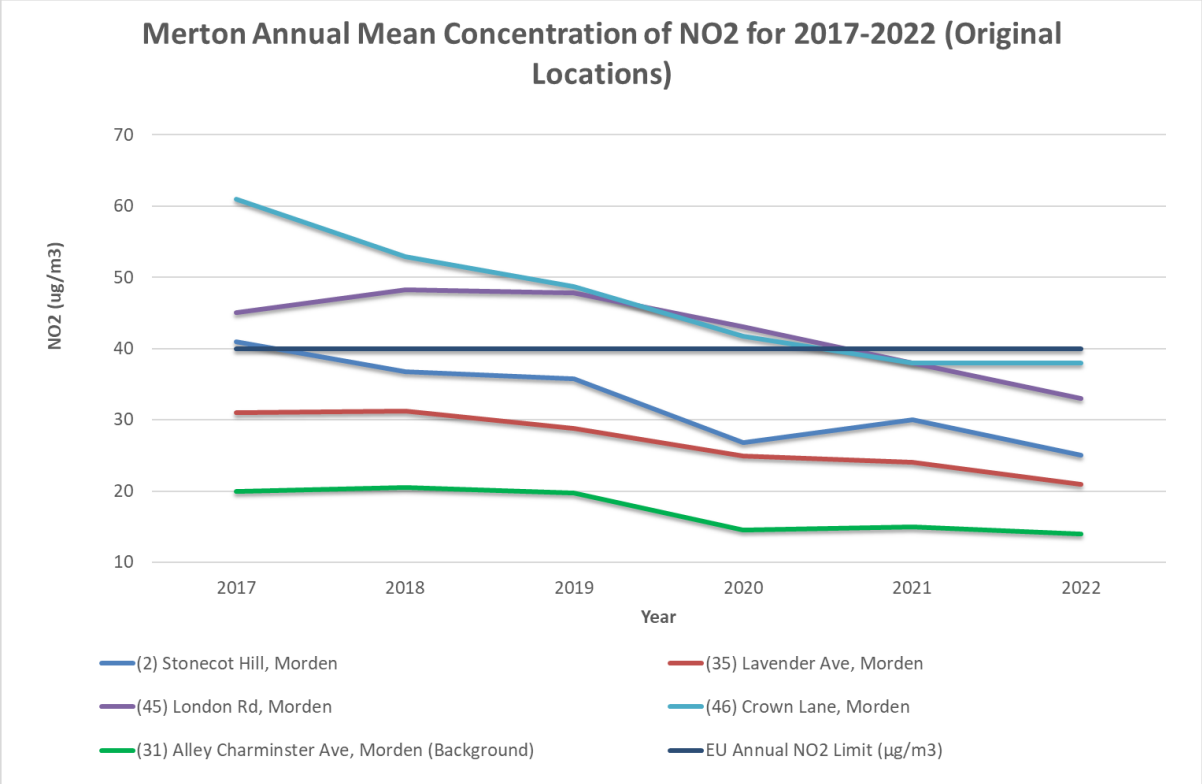


Chart 4 of 4: Morden



Notes: The site ID is provided in the chart legend in brackets and can be used to review full location details provided in Table C. Data for Merton's background

diffusion tube monitoring site has been included in all charts to aid the comparison of roadside/kerbside data with the borough background concentration.

Table E. NO_2 Automatic Monitoring Results: Comparison with 1-hour Mean Objective, Number of 1-Hour Means > 200 µg m^{-3}

Site ID	Valid data capture for monitoring period %([a])	Valid data capture 2022 %([b])	2016	2017	2018	2019	2020	2021	2022
ME9	100	69	No data	No data	0	1	0 (158.4)	No or insufficient valid results available for this year.	11 (109.6)

Notes

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

Exceedance of the NO_2 short term AQO of 200 µg m^{-3} over the permitted 18 hours per 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.

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

(b) Data capture for the full calendar year (e.g. if monitoring was carried out for six months the maximum data capture for the full calendar year would be 50%)

Prior to 11th October 2017 continuous monitoring of nitrogen dioxide was measured by instrument ME1. The roadside site was located at Morden Civic Centre and suffered a series of faults during 2016, no data is available for 2016 and 2017 for this reason. A new chemiluminescent NO_2 analyser was installed on the 11th October 2017 identified as ME9.

At the time of writing, all automatic monitoring data have been fully ratified. As the data capture rate was below 85% the 99.8th percentile of 1-hour means is reported in Table E. The 99.8th percentile of 1-hour means was calculated to be 109.6 μgm^{-3}, indicating that the 1-hour mean objective (short-term objective) is likely to have been met in 2022.

Where data capture is poor no firm conclusions can be drawn as results may not be representative of the full year and should be used for guidance only. In 2022 there were challenges maintaining equipment and sourcing technical components and calibration gases. There has been considerable resourcing allocated to refreshing the network in 2023, which will include $PM_{2.5}$ monitoring.

Table F. Annual Mean PM_{10} Automatic Monitoring Results (µg m^{-3})

Site ID	Valid data capture for monitoring period %(a)	Valid data capture 2022 %(b)	2016	2017	2018	2019	2020	2021	2022
ME9	100	36	24	24	34	28	26	23 (21.9)	26 (24.7)

Notes

The annual mean concentrations are presented as µg m^{-3}.

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

All means have been "annualised" in accordance with LLAQM Technical Guidance, if valid data capture is less than 75% and more than 25%.

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

(b) Data capture for the full calendar year (e.g. if monitoring was carried out for six months the maximum data capture for the full calendar year would be 50%).

Table F provides results for the automatic monitoring station at the Merton Road, South Wimbledon (ME2) site which houses a Beta Attenuation Monitor (BAM) particulate analyser. The automatic monitoring data for the automatic monitoring stations are subject to correction by the Environmental Research Group (ERG) at Imperial College London as part of the London Air Quality Network (LAQN). At the time of reporting data have been fully ratified and is not subject to change.

BAM particulate analysers are equivalent to the PM_{10} reference method and the applicable correction factor has been applied by ERG for all data presented in this report.

As the data capture rate for 2022 was below 75% annualisation of the data was required. This was completed using the LondonAir Tool, the details are provided in Appendix A3, Table M. Following annualisation the annual mean was estimated to be 24.7 μgm^{-3} indicating that the annual mean objective of 40 μgm^{-3} was likely to have been achieved at the Merton Road (ME2) site. However, it should be noted that where data capture is below 75% no firm conclusions can be drawn as results may not be representative of the full year and should be used for guidance only. In 2022 there were challenges maintaining equipment due to an issue with the cabin housing the analyser. There has been considerable resourcing allocated to refreshing the network in 2023, which will include $PM_{2.5}$ monitoring.

For London boroughs, as per LLAQM.TG(19) paragraph 3.10, current guidance states that the last four years of monitoring data should be considered, and a trend analysis undertaken to identify any significant changes. The data from Merton Road indicates there has been no significant change to annual mean PM_{10} concentrations over the time (excluding 2018). The same downward trend observed for nitrogen dioxide is not manifesting for particulate matter. This indicates that local measures along with regional policies implemented to reduce NO_2 are not as effective at mitigating PM_{10}. The updated London Atmospheric Inventory (LAEI 2019) released in 2022 estimates the most significant contributors to PM_{10} emissions in Merton to be road transport at 33%, followed by; construction 17%, resuspension 15% and domestic biomass/wood burning 13%.

An added complication is the range of PM_{10} pollution, it is not confined to localised sources but can travel large distances. Often PM_{10} pollution episodes (periods of

higher than normal particulate concentrations) often originate from agriculture and industry in continental Europe.

Although the annual mean Air Quality Objective for PM_{10} has been comfortably achieved over the last 7 years of monitoring, there remains no safe level for particulate pollution. London a focus is required to be maintained on Particulate Matter even when meeting the PM_{10} targets, because the London boroughs are collectively working to meet the World Health Organization (WHO) health-based limits by 2030.

In September 2021, WHO tightened the annual mean guideline values for PM_{10} and $PM_{2.5}$ making them significantly lower than the current UK/EU standard, $PM_{2.5}$ 5 μgm^{-3} and PM_{10} 15 μgm^{-3} (annual means). **Currently, PM_{10} would not meet the new WHO guideline value of 15 μgm^{-3} (annual mean) set to protect the public from the health effects of particulate matter.** It will be a huge challenge to drive down particulate matter concentrations to these levels in Merton based on borough monitoring data from 2016 to date. The same can be said for all London Boroughs.

Table G. PM_{10} Automatic Monitoring Results: Comparison with 24-Hour Mean Objective, Number of PM_{10} 24-Hour Means > 50 µg m^{-3}

Site ID	Valid data capture for monitoring period %[(a)]	Valid data capture 2022 %[(b)]	2016	2017	2018	2019	2020	2021	2022
ME2	100	36	8 (36.6)	10 (37.6)	13 (47.3)	20	11	8 (36.6)	6 (44.0)

Notes

Exceedances of the PM_{10} 24-hour mean objective (50 µg m^{-3} over the permitted 35 days per year) are shown in **bold.**

Where the period of valid data is less than 85% of a full year, the 90.4th percentile is provided in brackets.

(a) data capture for the monitoring period, in cases where monitoring was only carried out for part of the year

(b) data capture for the full calendar year (e.g. if monitoring was carried out for six months the maximum data capture for the full calendar year would be 50%).

Table G provides a comparison of the 2022 monitoring data with the 24-hour means objective (short-term objective). At the time of writing, all automatic monitoring data have been fully ratified. As the data capture rate was below 85% the 90.4th percentile of the 24-hour means is reported. The 90.4th percentile of the 24-hour means was calculated to be 44.0 μgm^{-3}, indicating that the short-term objective is likely to have been met in 2022. Where data capture is poor no firm conclusions can be drawn as results may not be representative of the full year and should be used for guidance only. In 2022 there were challenges maintaining equipment due to an issue with the cabin housing the analyser. There has been considerable resourcing allocated to refreshing the network in 2023, which will include $PM_{2.5}$ monitoring.

For London boroughs, as per LLAQM.TG(19) paragraph 3.10, current guidance states that the last four years of monitoring data should be considered, and a trend analysis undertaken to identify any significant changes. Due to historically poor data it is currently not possible to accurately identify a trend in the data. Data capture was below 85% in 2016, 2017, 2018 and 2021 data the 90.4th percentile result has also been reported for comparison, this figure is bracketed. There appears to be a spike in 2019, elevated PM_{10} concentrations can result from 'pollution episodes', which are often the result of local combine with imported transboundary conditions from elsewhere in the UK and Europe. It is important to highlight that despite reduced traffic during 2020 due to COVID-19 a marked reduction in PM_{10} was not observed. The 24-hour Air Quality Objective is comfortably achieved, however, London a focus is required to be maintained on Particulate Matter even when meeting the PM_{10} targets, because the London boroughs are collectively working to meet the World Health Organization (WHO) health-based limits by 2030.

In September 2021, WHO tightened the annual mean guideline values for PM_{10} and $PM_{2.5}$ making them significantly lower than the current UK/EU standard, $PM_{2.5}$ 5 μgm^{-3} and PM_{10} 15 μgm^{-3} (annual means). **Currently, PM_{10} would not meet the new WHO guideline value of 15 μgm^{-3} (annual mean) set to protect the public from the health effects of particulate matter.** It will be a huge challenge to drive down particulate matter concentrations to these levels in Merton based on borough monitoring data from 2016 to date. The same can be said for all London Boroughs.

2. Action to Improve Air Quality

2.1 Air Quality Action Plan Progress

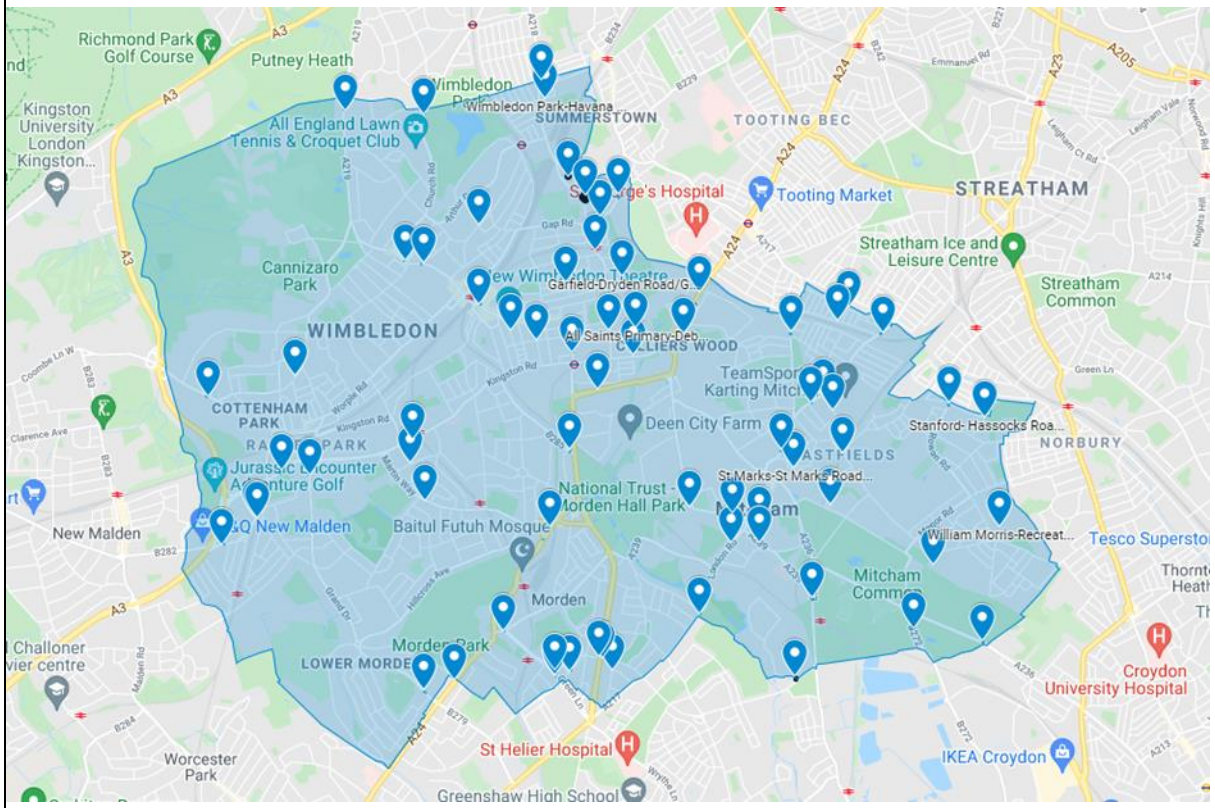
Table J provides a brief summary of the London Borough of Merton's progress against the Air Quality Action Plan, showing progress made this year. New projects which commenced in 2022 are shown at the bottom of the table.

Table J. Delivery of Air Quality Action Plan Measures

Measure	Action	Progress in 2022 towards Merton AQAP 2018-2023
1	Make available on the Council website all monitoring data in an accessible form.	Annual Status Reports containing tabulated and mapped data are publicly available on the Council website. Discussions ongoing to embed mapped air quality data on the Council website.
2	Continue to annually review our diffusion tube network and identify additional priority locations.	Diffusion tube monitoring locations are reviewed annually in November/December and implemented in January. Locations are removed or relocated in response to council or community concerns regarding potential pollution hotspots. In 2022, the diffusion tube network spanned 61 locations including schools, town centres and main routes in the borough.
3	Positively encourage and support citizen science	Progress has been made in expanding the citizen science project In Merton. As a council we are working with Sustainable Merton and a representative from Wimbledon Park

	activities where these actively contribute to identify and tackling air quality in the borough.	Residents Association to coordinate and distribute nitrogen dioxide diffusion tubes out to the willing volunteers across the borough. The objective of the project is to engage with residents of Merton, raising levels of positive involvement and interest in air quality. Air Quality Officers provide training and ongoing support to help review the data collected. Community data is reported in Appendix D.
4	Invest in hand-held monitoring equipment that can be used by citizen science groups and schools.	Ongoing. Investment planned in a new calibrated mobile monitor to use for monitoring specific locations and support projects, including $PM_{2.5}$ and sub PM_1 monitors. A new deployable monitor was procured for the Pollution Team to be used for complaint investigation and/or citizen science projects.
5	Seek additional funding for a refresh and update of our monitoring network including grant funding, Section 106 and Community Infrastructure Levy.	Ongoing. Procurement commenced in 2022 to refresh and expand the automatic monitoring network and to increase the number of automated stations and include the capture of $PM_{2.5}$ data.

6	Produce and update an interactive map of diffusion data that can be contributed to by groups and citizen science activities.	Not progressed in 2022. Carried forward to 2023. Work continues to embed web maps on the council website. It will be possible to embed web maps on the Council website for groups to view the data that they have collected (all data will be uploaded by the Council).
7	Assess and incorporate new technology in the world of air quality.	Merton is keen to adopt and use new technology to monitor & model air quality. In 2021 a large low-cost sensor roll out was completed as part of the InnOvaTe (Internet Of Things) (IOT) project. The Innovate project continued throughout 2022. The network of 68 traffic sensors (Vivacity) co-located with air quality monitors (Breathe London Nodes), was installed to capture localised real-time data around schools, Low Traffic Neighbourhoods, Air Quality Focus Areas, Town Centres and routes in and out of the borough. The Breathe London Nodes measure fine particulate matter $PM_{2.5}$ and nitrogen dioxide NO_2, the data is streamed live to a dedicated website https://www.breathelondon.org/. The Vivacity traffic data is summerised in reports and the live data made available to council officers.

		To disseminate the data more widely and enable data insights the project team worked with Hitachi and Microsoft to develop an interactive platform, this work is ongoing. The air quality data gathered has been peer reviewed and is provided in Appendix D. The data will also be used to influence Merton's new Air Quality Action Plan for 2023-2028. **Map of Breathe London Node / Vivacity Traffic Sensor Network in Merton** 

		A second Innovate project which trialled real-time monitoring of pollutants including NO_2, PM_{10}, $PM_{2.5}$, PM_1 and noise at three waste management sites also continued through 2022. Using real-time monitoring and an alert system, the Air Quality Team were able to drive changes in behaviour by highlighting the types of activities that cause spikes in pollutant levels. The project has proven that by investing in the use of innovative technology, Merton Council have been able to encourage three private waste management businesses to take ownership of their emissions output. Backed up by third party data, the businesses have been able to allay the concerns of surrounding communities, prove regulation compliance, improve the health of workers and residents nearby whilst also addressing the issues of operating sustainability to protect our environment. Transparency of emissions data has enabled better working relationships between all project partners. The Air Quality Team are finalists in both the Local Government Chronicle and Municipal Journal Awards 2023 as a result of their work on traffic and transport monitoring and with waste transfer sites in Weir Road.
8	We will commission modelling of air quality in the borough up to 2022, by King's College London,	An updated London Atmospheric Emissions Inventory (LAEI) for the base year 2019 was published by the Greater London Authority in 2021. The inventory provides emissions estimates of key pollutants (NO_x, PM_{10}, $PM_{2.5}$ and CO_2) by source type. The LAEI provides a best estimate of pollution across the borough where direct monitoring is not available.

	including predicted trends and contributing sources. Note: the faculty at King's College London that undertakes modelling moved to Imperial College London in 2020	These maps are available to view within the Council's mapping system and form part of the Air Quality data resource available to the Council and in the near future the public. Funding was secured for the key project in 2020 to complete borough specific air quality modelling through sunk funding arrangements. This has not yet been completed. The air quality monitoring undertaken through the Innovate project reported against Action 7 has been a precursor to the aforementioned 'borough specific air quality modelling'. Merton installed a dense coverage of low cost Breathe London sensors to monitor $PM_{2.5}$ and NO_2. The air quality data gathered has been peer reviewed and is provided in Appendix D.
9	Map Focus Areas & air quality 'hotspots' on planning GIS mapping to ensure these areas are highlighted	Completed.
10	Ensure that air quality is a vital part of the Council's New Local Plan.	The submitted Local Plan has embedded measures to improve air quality in the borough. A number of policies within the Plan contribute to tackling poor air quality for example sustainable transport, air quality, places and spaces in a growing borough (design), health (including mental health) and wellbeing, and climate change policies. It clearly states that developers must have regard to and follow *any guidance provided by Merton Council on local environmental impacts and pollution as well as on noise generating*

		and noise sensitive development. Where necessary, the Council will set planning conditions to reduce and mitigate pollutant impacts (including air quality). The Local Plan requires Air Quality Assessment (AQA) (depending on development) to be submitted with planning applications. The further guidance on AQA can be found in the Air Quality SPD. In addition, the Local Plan has adopted a number of approach which contribute to tackling poor air quality for example: Healthy Streets Approach. 20 minutes neighbourhoods Importantly, the Local Plan has had regard to the London Plan and it associated guidance for example Mayor of London Transport Strategy and Environment Strategy and contributes to the target and aims of London as set by the Mayor of London. Merton's Local Plan submitted to the Planning Inspector on the 2nd December 2021. The public Examination of the Local Plan will be in two stages. Stage one will commence on the 14th June 2022 with stage two starting on the 4th October 2022. https://www.merton.gov.uk/planning-and-buildings/planning/local-plan/newlocalplan/local-plan-submission

11	Adoption of New AQ Supplementary Planning Document (SPD) to ensure emissions from new development are minimised and effective mitigation is integrated into the scheme of design.	Completed. Merton formally adopted the Air Quality Supplementary Planning Document (SPD) on 22nd June 2021 and is now a material planning consideration when determining development proposals submitted for planning permission. SPD is material consideration supporting and provide further guidance on implementing Local Plan and technical guidance
12	Ensure air quality neutral development is required, and request where applicable an air quality assessment	Ongoing. This is now standard practice in the planning process. Planning statistics are provided in Table K.
13	Work with key partners in the GLA to explore the feasibility and delivery of air-quality-positive development particularly around our Focus Areas.	Completed. However, the submitted Local Plan requires that '*Development proposals in Air Quality Focus Areas (AQFAs) or development proposal that are likely to be, used by large numbers of people particularly vulnerable to poor air quality, such as children or older people should demonstrate that design measures have been used to minimise exposure following London Plan policy SI 1: Improving air quality'.*

		In March 2021 the Greater London Authority (GLA) published Air Quality Positive Guidance for consultation. The guidance was adopted in January 2023. The Air Quality Positive approach aims to maximise benefits to local air quality in and around a large-scale development sites and masterplan area while also minimising exposure to existing sources of poor air quality. It requires planners, designers, architects and air quality experts to demonstrate what measures have been taken during the design stages to achieve the best possible outcomes for air quality.
14	Ensure that new development contributes to funding air quality measures in the borough through Section 106 and CIL payments.	Ongoing. Merton's submitted Local Plan has embedded that the Council states clearly that the Council will seek financial contributions using Planning Obligations towards air quality measures where a proposed development is not air quality neutral, or mitigation measures do not reduce the impact upon poor air quality. The Air Quality Team have successfully obtained Section 106 funding from large scale developments to fund new air quality monitoring equipment.
15	Ensure that new development have a scheme of mitigation for tackling air quality including	Ongoing. The effective delivery of this action falls across several teams within the council including Air Quality, Climate change and Transport.

	traffic reduction and low emissions strategies.	
16	Produce and promote guidance to homeowners on what they can do to their homes to help reduce pollution in the borough.	In November 2020, Council approved Merton's Climate Strategy and Action Plan which sets a framework to achieve a net-zero carbon borough for 2050 and a net-zero carbon Council by 2030. It sets out the major transitions that need to take place in the borough to buildings, transport and the economy. The action section on p10 and 11 contains a high-level but comprehensive set of actions that can be taken to reduce emissions targeted at those who own their own home, landlords, businesses and other organisations and also how the Council will support. These include reducing energy consumption and electrifying heating, both of which are likely to reduce the air pollution impact of boilers; responsible for about 1/5 of NOx emissions in the UK. Merton's Climate Delivery Plan Year 2 was adopted in February 2022 As part of the commitment to supporting emissions reduction, Merton Climate Action Group has been set up as a joint Council community initiative to support community-led carbon reduction projects. One of the themes is Building and Energy. In 2021 the group have focused on setting up Energy Advice Cafes in Merton to help people to reduce energy bills through switching, putting in place energy efficiency measures and undertaking retrofit on their properties. In 2022, Merton Council

		- recruited new Community Retrofit Officers to lead on the retrofit of residential and non-residential buildings in Merton, which includes engagement with homeowners; - supported fuel poor households in accessing funding to retrofit their homes through the Mayor's Warmer Homes Scheme; - supported Housing Associations in bidding for national retrofit funding; - worked with the Buildings & Energy sub-group of Merton's Climate Action Group to promote energy efficiency and retrofit by developing case studies and delivering the Energy Matters project in Merton schools.
17	Consider how we can extend the provision of vehicle charging to smaller residential development to ensure the borough is ready for electric vehicles.	Ongoing. No additional updates. Merton has continued to develop our transport policies including through the submission of Merton's New Local Plan[1], which strengthens the focus towards active and sustainable travel, in accordance with the Mayor's Transport Strategy[2], the new London Plan[3] and the Government's recently published Decarbonising Transport strategy[4]. The Council will continue this approach in 2022, through the further development of a LIP delivery plan for the period up to 2025 and work towards long-term transport strategies for the delivery of integrated cycling, walking and EV charging networks. (1) Merton Local Plan submission to the Secretary of State (2021), available at: https://www.merton.gov.uk/planning-and-buildings/planning/local-plan/newlocalplan/localplan-submission

		(2) Mayor's Transport Strategy, available at: https://tfl.gov.uk/corporate/about-tfl/the-mayors-transport-strategy (3) Mayor's London Plan (2021), available at: https://www.london.gov.uk/what-we-do/planning/london-plan/new-london-plan/london-plan-2021 (4) Department for Transport's Decarbonising Transport (2021), available at: https://www.gov.uk/government/publications/transport-decarbonisation-plan
18	Continue to run our Non-Road Mobile Machinery (NRMM) Project.	Successfully extended to 2024/25. Recovered match-funding from all boroughs. Numerous cluster group and industry presentations. Continued involvement with the refresh to Stage V of the Generators Fleet. Many depot visits in industrial outreach and trade show attendances, increasing awareness and developing a cutting edge understanding of the innovative technologies pertinent to generator deployment. 2022 saw the project start to factor more fully the 2040 zero-emission commitments of the mayor. Trip to the JCB Hydrogen facility took place.
19	Seek additional funding from DEFRA/GLA/Construction Industry to promote good practice on construction sites.	Funded as part of Action 18 – NRMM London Wide Project.

20	Request adoption of new techniques that have proven to be beneficial to air quality, such as Construction Logistics and Delivery and Service Planning.	Ongoing. No additional updates.
21	Review the Council's allocation of the Section 106 and CILs budget to see if this can provide funding to benefit air quality measures	Ongoing. Merton's Air Quality Supplementary Planning Document (SPD) was adopted in June 2021 and includes Section 106 arrangements. Planning Obligation (often called s106 agreements) are agreements with developers for the provision of site-specific mitigation measures necessary to ensure a development meets the requirements of the Local Plan and for a number of areas including affordable housing, local training, skills, job brokerage and the obligation of Merton's Air Quality Action Plan. Merton's Planning Obligation SPD explains how obligations are used. Under the CIL Regulations 2010 CIL expenditure is not accounted for at the planning application level. It's a fundamental part of CIL, it will never change for as long as CIL lasts.
22	Continue to request robust and enforceable measures	Not progressed in 2022. Carried forward to 2023.

	to minimise the impact of developments during the construction phase.	Now that the new London Plan SI (Improving Air Quality) and the Merton Air Quality Supplementary Planning Document (June 2021) is in place, planning conditions will be reviewed in 2023 as part of the Regulatory Services Partnership Pollution Team initiatives.
23	Commitment to a cycle Quiet-way between Clapham Common & Wimbledon forming the Merton section of the Wandle trail.	Ongoing. No additional updates. Merton to liaise with TfL regarding rebranding of route/ upgrade to signage.
24	Review funding available through Section 106 and CILs around transport and travel infrastructure.	Ongoing. No additional updates. Where necessary for development to take place, Merton' seeks section 106 contributions towards transport and travel infrastructure. In London all boroughs pay Community Infrastructure Levy towards Crossrail. Transport improvements around individual sites are provided through funding from developments (via Section 278 legal agreements). Since 2019 Merton's Neighbourhood fund has sponsored Merton Chamber of Commerce's "Community Champions" programme, one of whose roles was raising awareness of actions residents could take to improve air quality
25	Carryout a borough wide cycling network audit to	Ongoing. No additional updates.

	review and update the network.	Cycling part of Merton's Local Improvement Plan 3, delivering the Mayor's Transport Strategy. Merton's Local Implementation Plan (LIP) to deliver the Mayor of London's transport strategy was formally signed off by TfL in August 2019 https://www.merton.gov.uk/streets-parking-transport/lip3 A cycling strategy will be developed by 2023 as set out in the Climate Strategy Action Plan.
26	Programme of installing bicycle infrastructure	Ongoing. No additional updates. To encourage more people to cycle and improve safety for cyclists within the borough of Merton, light segregation in the form of cycle lane defenders have been installed within the borough in response to Covid 19 at locations including Church Road, Plough Lane, Haydons Road Bridge and Merton High Street. Design work is underway to install segregated cycle lanes on Plough Lane in the vicinity of the stadium. Upgrades to an existing path are due to be completed summer 2022 between Deen City Farm and tram crossing. 20 secure cycle storage units (cycle hangars) have been installed around the borough, providing 120 cycle parking spaces. 20 cycle shelters have been installed at 16 schools providing over 200 cycle parking spaces. In 2021, Merton successfully completed the delivery of its emergency Covid Transport Strategy to help support active travel in the borough[1] . Projects delivered included 4 cycle

		lanes, 5 Low Traffic Neighbourhoods, 28 Schools Streets, 20 Cycle hangars and 20 school cycle shelters. However, the ongoing funding crisis at TfL resulted in the borough receiving a significantly reduced Local Implementation Plan (LIP) funding allocation in 2021/22, so delivery of transport infrastructure projects in the latter half of 2021 has been much less than anticipated. The Council continued to deliver programmes to support active travel, such as cycle training[2], health walks[3], the Stars School Travel Plans[4] , and maintaining Safer Routes to School[5] and Public Rights of Way. However, there was also a reduced level of delivery of some of these projects in 2021 compared to previous years due to the impact of Covid restrictions and the reduced TfL LIP funding allocation. The Council also supported Merton's Climate Action Group (Transport sub-group) who have been involved in promoting a number of national initiatives locally to engage with residents and promote active travel and wider climate action in Merton. These have included Sustrans' Big Pedal[6], World Car Free Day[7] and Cycle buddies[8]. 1. Merton's Covid-19 Transport Strategy available at: https://www.merton.gov.uk/streets-parking-transport/lip3 2. Merton cycle training for adults https://www.merton.gov.uk/streets-parking-transport/road-safety/adult-cycle-training and children https://www.merton.gov.uk/streets-parking-transport/road-safety/childrens-cycle-training 3. Merton Walks4Life https://www.merton.gov.uk/healthy-living/sport-and-healthy-living/walk-4life

		4. Merton supports TfL's STARS programme https://stars.tfl.gov.uk/ 5. Merton Safer routes to schools: road safety improvements https://www.merton.gov.uk/streets-parking-transport/traffic-management/safer-routes-to-school 6. Sustrans' Big Pedal 2021 https://bigpedal.org.uk/ 7. Merton Play Streets https://www.merton.gov.uk/streets-parking-transport/streets-and-pavements/play-streets 8. Merton Cycle Buddies http://www.mertoncyclingcampaign.org.uk/p/cycle-buddies.html
27	Feasibility study to consider the use of Clean Air Zones (CAZ's) or a Merton Specific Ultra Low Emission Zone for Focus Areas and beyond.	Not progressed during 2022. This project was deferred due to funding, LIP funding no longer available. Traffic monitoring was delivered through the Innovate project in 2021/22 refer to Action 7 for details. The ULEZ will be expanded on the 29th August 2023 to cover all London Boroughs.
28	Air Quality Audit traffic and congestion in our three air quality focus areas.	Air quality and traffic data collected in 2022 for the Innovate project (refer to Action 7) has been reviewed in 2023 and included in a Committee paper submitted on impact of transport and air quality. Updates to follow in the ASR 2024.
29	Support and promote the use of a cleaner vehicle	Ongoing.

	checker to inform the public of cleaner vehicle choice.	Corporate communications around the expansion of ULEZ and need for residents to understand if there are compliant or not.
30	Lobby for Cleaner Buses and Taxis	Ongoing. No additional updates. The following activities are ongoing but were not focused on in 2020 or 2021 due to the pandemic. The Mayor's Transport Strategy (MTS) was published in March 2018. Proposal 29 sets outs timeframe as to how the Mayor will clean London's bus fleet and that by 2037 all TfL buses will be electric or hydrogen. Merton Council continues to lobby for a greater share of TfL bus fleet investment to be targeted towards providing zero emission vehicles on the most polluted routes passing through this borough. We believe that TfL's MTS target does not go far enough and that the bus procurement programme should be accelerated so that the whole of greater London can enjoy the benefits of cleaner buses much sooner. Individual bus route contracts are typically retendered on a rolling 5 to 7 year basis. This Council strongly believes that all new bus service contracts should explicitly stipulate the purchase of only electric or hydrogen buses now (or hybrid double deckers, if cleaner alternatives at not available at the time). It is also noted that from 2020 TfL will buy only electric or hydrogen single deck vehicles and all double deckers meet Euro VI standard as a minimum. Current low emission electric bus routes in the borough include 200, 413 and 264.

<table>
<tr>
<td>31</td>
<td>Introduce Air Quality initiatives, benefits and monitoring in the new South Wimbledon Junction design and build.</td>
<td>Not progressed due to lack of Transport for London Funding. No additional updates.

South Wimbledon junction will be reviewed in line with the Healthy Streets objectives, which include sustainable transport and improved air quality. All measures that are funded via the Mayor’s Transport Strategy (LIP) will be considered against the healthy streets agenda and objectives.</td>
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<tr>
<td>32</td>
<td>Review the impact of our diesel levy* and consider a review of parking and charges to help reduce combustion engine vehicle use and the consequent emissions.

*Note: The Sustainable Communities and Transport Overview and Scrutiny Panel to conduct pre-decision scrutiny on the scope of any reviews on parking levies.</td>
<td>In April 2017, Merton took the innovative and bold decision to implement a diesel levy on parking permits to encourage drivers/owners in Controlled Parking Zones (CPZs) to move away from diesel vehicles.

Expansion of the Ultra Low Emission Zone (ULEZ) on the 29th August 2023 is expected to significantly accelerate the reduction in diesel vehicles registered in CPZs.

Merton also offers an incentive for CPZ residents to change to electric vehicles. Permits for these cars are offered at a subsidised price of £20 per annum.
<table>
<tr><th>Period</th><th>Petrol</th><th>% of total sales</th><th>Diesel</th><th>% of total sales</th><th>Electric</th><th>% of total sales</th><th>Total</th></tr>
<tr><td>2017/18</td><td>13,345</td><td>70%</td><td>5,578</td><td>29.5%</td><td>23</td><td>0.5%</td><td>18,946</td></tr>
<tr><td>2018/19</td><td>14,332</td><td>70%</td><td>5,990</td><td>29.4%</td><td>51</td><td>0.6%</td><td>20,373</td></tr>
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<tr><td>2019/20</td><td>14,107</td><td>73%</td><td>5,025</td><td>26%</td><td>112</td><td>1%</td><td>19,244</td></tr>
<tr><td>2020/21</td><td>16,108</td><td>73%</td><td>5,565</td><td>25%</td><td>263</td><td>2%</td><td>21,936</td></tr>
<tr><td>2021/22</td><td>17,461</td><td>75%</td><td>5,248</td><td>22.5%</td><td>504</td><td>2.5%</td><td>23,213</td></tr>
<tr><td>2022/23</td><td>17,955</td><td>77%</td><td>4,697</td><td>20%</td><td>738</td><td>3%</td><td>23,390</td></tr>
</table>
Since the introduction of the diesel levy, in conjunction with the proposed extension of the ULEZ, there has been a reduction of over 30% in the proportion of permits issued to diesel vehicles. During the same period the proportion of permits issued to electric vehicles has increased from around 0.5% to 3.1%.

Future proposals may seek to raise the cost of parking permits for the highest carbon-emitting vehicles, to address the challenge of the climate emergency.
</td>
</tr>
<tr>
<td>33</td>
<td>We will continue to support, fund and promote airText and other health based initiatives in the borough.</td>
<td>Ongoing.

Merton continues to fund airText a publicly available air pollution forecast service.

https://www.airtext.info/

In 2022, Merton commissioned a review of air quality and health messaging and identified that there is a clear gap in information about local and internal air quality and the impact on the vulnerable (refer to NP: 2022 at the end of Table J). Following the review Merton coordinated a DEFRA bid on behalf of 15 London Boroughs, but this was not successful. It</td>
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</table>

		is anticipated that this work will be picked up locally by the borough in mid-2023 and coordinated though Public Health and comms. Updates to follow in 2024 ASR.
34	We will continue to support and update information on our Love Clean Air Website.	Ongoing. The 'South London Cluster Group' formed of Bromley, Croydon, Kingston, Lewisham, Merton, Richmond, Sutton, and Wandsworth councils worked together to create Love Clean Air to promote air quality in the region. Love Clean Air is all about letting you know how clean the air is in South London, and what you and others can do to make it even cleaner. https://lovecleanair.org/
35	We will review and update our own corporate website to include themed initiatives.	Ongoing. Council Communications Plan reviewed to keep air quality a running feature. In 2022, we produced and promoted a short film on the cargo bike scheme which was launched in partnership with Love Wimbledon, Cross River Partnership and Xero. Across our social channels, this video received hundreds of views and drew reactions and comments from around 40 residents and partners. The Council remains committed to raise awareness about the smoke control order in the whole borough and that the use of some solid fuel is prohibited. In Autumn/Winter 2022/23 communications ran a campaign on social media and in the weekly residents e-newlsetter reminding them of new requirements in smoke control areas.

		The campaign will also coincide with a refresh of our Council Smoke Control Area webpage to ensure that residents have all the necessary information to hand.
36	We will play an active and co-ordinating role in national and regional campaigns such as National Clean Air Day.	Ongoing – Annual action. **Clean Air Day - 16June 2022** On Clean Air Day itself an anti-idling event took place at Motspur Park Level Crossing. The officers that attended the event encouraged the drivers of idling vehicles (vehicles that are stationary with engine on) to switch their engines off On the 18th June, officers from the Air Quality Team attended Merton's Climate Change Festival at Cannons House in Mitcham to engage with the public to promote active travel and discuss air quality topics. Lots of freebies were handed out with bicycle seat covers, drawstring bags and pens being very popular. All the freebies were branded with Clean Air Day/Love Clean Air designs. XeroE cargo biker couriers, our CAV4 partner (see NP1 2021 at end of Table J) also attended to promote sustainable travel for business deliveries. **Car Free Day - 22nd September 2022** The Air Quality Team, Climate Team, Sustainable Merton and Dr Bike promoted the day and held events in Morden and Wimbledon. The team promoted active, sustainable travel and educated the public about the benefits of having less cars on the road. This message was spread brilliantly by the team and the feedback from the public was extremely positive.

		As an extension to Car Free Day, the Air Quality Team attended a Cycle Cinema event at Cannons House in Mitcham on 17/09/22, again taking the AQ stall to discuss air quality topics. The Air Quality Team also ran a Car Free Day competition for schools across the London Borough of Merton. The competition theme was – My Walk, Cycle or Scoot to School Friend. Children had the opportunity to draw a picture of a real or imaginary character that encourages you to walk, cycle or scoot to school. Children also had the option to write a short accompanying story or poem (max. 200 words) to tell the AQT a little about the character and how it inspires you to be active for the school commute. There were lots of fabulous entries, winners received book tokens.
37	Continue to aspire to London's Cleaner Air Borough status award.	Ongoing: As a Beacon borough, key focus areas in Merton include Non-Road Mobile Machinery, School Air Quality Audits, Idling Action and Wood Burning.
38	Ensure that the good work and best practice we are delivering is publicised and disseminated to colleagues in the air quality industry.	Ongoing: Merton has successfully obtained funding to continue the ground-breaking Non-Road Mobile Machinery (NRMM) project into 2025. This operates throughout London as Cleaner Construction. Best practice is shared with stakeholders including London Boroughs, the GLA and construction industry. Plans are well-advanced to extend activities in a proposed 'Beyond Construction Project' which shall take the enforcement model into the streetworks, waste transfer and events sectors. Initiation pending funding sign-off at GLA.

		Learnings in the non-Road sector have been shared within the Westminster Commission for Road Air Quality, of which Merton is a member and active participant. Over 6 presentations have been given to construction industry SHEQ teams, in training events provided by the NRMM Project Team. The first Presentation to the membership of the British Safety Council took place, focussing on 'Diesel Emissions as a known carcinogen – How the construction Industry is protecting its workers'. Presentation given to the TfL Procurement Stakeholders group regarding NRMM standards in street works. The first presentation event toward the film industry sector took place this year. In December 2021 the Air Quality Team began production of a quarterly 'Air Quality Newsletter' to showcase the variety of work undertaken in the field. The newsletter is circulated to both internal and external partners including the GLA and has been positively received.
39	Work closely with our Public Health colleagues around joint health benefits.	Ongoing: We work closely and meet regularly with colleagues in Public Health including Directorship. Almost all air quality initiatives are now linked to the public health agenda.

		Funding was obtained by the Council's Public Health Team from the Local Government Association (LGA) Behavioural Insights programme to tackle engine idling in the borough. Refer to Action 59 for details.
40	Establish a borough-wide air quality group.	This action was previously delivered through the Environmental Sub-Group (ESG) however, in 2022 the group's focus shifted to Climate Change. Some localised air quality actions such as monitoring are now delivered through citizen science group.
41	Establish an internal steering group within the local authority.	Completed. The steering group includes colleagues from Public Health and Climate Change. The steering group will be refreshed as part of the new Air Quality Action Plan (2023-2028). A Cross party working group will be established in 2023 as part of AQAP.
42	Provide internal training sessions on air quality to internal partners and Councillors.	Not progressed during 2022. Carried forward to 2023.
43	Co-ordinate air quality funding and lobby national government to provide further financial and strategic support for local	Ongoing: We actively respond to all consultations and initiatives, locally, regionally and nationally to raise the issues of air quality and the support needed for Local Authorities.

	authorities to improve air quality.	In response to consultations the Air Quality Team liaises with the Association of Public Health Directors, London Councils, Local Government Association and has an established working relationship with the Greater London Authority.
44	Lobby Transport for London (TfL) for action on cleaner buses and taxis in our Air Quality Focus Areas.	This is a priority for the borough and an action we continue to do through partnership meetings with TfL. The Ultra Low Emission Zone (ULEZ) will be expanded to all London Boroughs from the 29th August 2023. The ULEZ will apply to cars, motorcycles, vans and specialist vehicles (up to and including 3.5 tonnes) and minibuses (up to and including 5 tonnes).
45	The Director of Public Health (DPH) to be kept fully updated on air quality status and initiatives.	Ongoing: The Air Quality Team regularly meets with working group Air Quality and Health Delivery Group to share Best Practice.
46	Public Health teams to support engagement and projects aimed at local stakeholders (businesses, schools, community groups and healthcare providers).	**Superzone project:** The Superzone primary school's community, including pupils and parents, participated in three engagement workshops, followed by a communal 'walk home' in which participants took photos of the environment and discussed how it impacts their wellbeing. Issues raised included traffic congestion around school gates, air quality, safety concerns on walking routes due to poor lighting, under-use of green assets, litter, and the lack of public art and community ownership of public spaces.

		Over 2022/23 Public Health has secured three grants for three primary schools to participate in the GLA School superzone programme. Merton Abbey Primary School began its active Travel Pilot in May 2022, and will complete in June 2023 with the intention of introducing a school wide behaviour change to eliminate all car journeys for the school run. Abbotsbury Primary began its safer travel / after school play space pilot in February 2023 and will complete in 2024. This pilot will focus the pupil's needs for safe passage to and from school via their local park, to redesign the Central Road to be child friendly. St Mark's Primary began its pilot in January 2023 and will be completed in 2024. This pilot is focused on reducing the threat of harm and hazards faced by the students, parents and staff on the school run. This has resulted in a steering group of multidisciplinary teams to meet regularly to synchronise all council efforts to improve safety.
47	All air quality policies to be signed off by the Director of Public Health and to form close links to Public Health objectives.	Ongoing.
48	Make air quality part of The Health & Wellbeing Strategy / Joint Strategic Needs Assessment (JSNA)	The Director of Public Health released the Annual Public Health Report in 2022/2023. There is a great focus on air pollution and climate change, the report going to the Health and Wellbeing Board in June 2023 will include a more focused set of solutions for the Board to decide on.

	– the Director of Public Health to be retained as a member of the Air Quality steering group.	
49	Review our procurement contracts for outsourced transport services and incorporate policies to establish the best and most cost effective fleet possible.	No additional updates. The Council continues to operate with c90 front line vehicles which are purchased through an agreed Capital programme. We are committed in our aim of being carbon neutral by 2030 and are currently seeking external funding for a power upgrade into the Garth road transport depot. If successful we will look into the required infrastructure required to support a fully carbon neutral fleet of vehicles. With reference to the Council's outsourced service such as waste collection and street cleansing the current fleet is scheduled to be replaced in 2025. For more information Merton Council's fleet and transport policies are set out in **Merton's climate strategy and action plan** on pages 22-25 in relation to the borough, and 28 and 29 in relation to actions to electrify the Council fleet.
50	Review our maintenance and servicing arrangements for our	Initial Public Sector Decarbonisation Scheme (PSDS) programme has provided funding for the installation of 4 PV batteries, which will lower utility consumption on site by increasing use of renewable technology. A second PSDS bid has been successful for the upgrading

	buildings to ensure that these are as energy efficient and cost effective as possible.	of heating in the civic centre to a low carbon system which will reduce emissions from the site. This work is funded till end March 2025. Site energy surveys have been undertaken on 20 sites to start preparing sites for climate emergency targets.
51	Ensure all new build and extensions within the council portfolio are to the highest, most efficient standards possible within the allocated budget.	See Action 50
52	Encourage more walking, cycling and use of public transport for council business and review active travel plan for all staff.	No additional updates. The review of the Council's Active Travel Plan and parking arrangements for staff across the council which was not been progressed in 2020 or 2021 due to COVID-19 and the Civic Centre being closed and most staff continuing to work outside the civic centre. However, the Council's review of working arrangements post pandemic will influence commuting frequency and staff travel. The review is likely to conclude in 2023 Merton Council have a fleet of electric and non-electric bikes for staff and investment in new Brompton bikes that can be taken on public transport to move staff away from private vehicle use

		Merton also offer a business mileage scheme for cycling, to push staff towards cycling. Our Cleaner Construction project (NRMM) operates a Brompton bicycle loan scheme for staff to travel across London sustainably by public transport and bicycle.
53	Review staff parking to reduce the use of personal vehicles.	No additional updates. Project currently underway to reduce use of private vehicles by staff. This will include any emission charging for staff permits. This was not progressed in 2020 and 2021 due to the Civic Centre being closed due to the pandemic. However, the council's review of working arrangements post pandemic will influence commuting frequency and staff travel.
54	Recruit an Air Quality Officer, funded by our Diesel Surcharge.	Completed.
55	We will work closely with our Public Health colleagues to keep up-to-date with the latest research relating to air quality and health.	Ongoing: Regularly meet with working group Air Quality and Health Delivery Group to share Best Practice. As the Air Quality team sit within the Regulatory Services Partnership formed of Merton, Wandsworth and Richmond, we have the added benefit of sharing knowledge and expertise across all three partner boroughs.
56	We will work closely with Imperial College London*,	Annual meetings attended by Air Quality Officers.

	the Greater London Authority and APRIL (Air Pollution Research in London – air quality expert group) to review the latest monitoring techniques *Formerly King's College London	The low-cost air quality sensors (Breathe London Nodes) rolled out across Merton in 2021 (refer to Action 7) are managed by Imperial College London. We continue to work closely with Imperial to maximise the benefit of the new monitoring network.
57	Apply for grant schemes and incorporate new technologies and best practice.	Projects in 2022: Funded by the third round of the Mayor's Air Quality Fund (2019-2022): • Idling Action – a project to take action on idling (including enforcement), spanning 27 boroughs. Concluded in March 2022. • Non-Road Mobile Machinery Clean Air Zone enforcement – a pan-London project to inspect construction sites in every borough to ensure they are using the cleanest construction equipment. Successfully extended to 2025. Funding awarded from Defra's Air Quality Grant scheme: Wood Burning Research and Behaviour Change project (refer to NP2: 2022 at the end of Table J)

		Funding awarded from Local Government Association (LGA) Behavioural Insights programme. Progress delayed during 2020 and 2021 due to COVID-19, the project completed in 2022, refer to Action 59 for details. Funding from the South London Partnership. Innovate project, Merton network and Weir Road, refer to Action 7.
58	Disseminate and publicise our ground-breaking work around schools and Non Road Mobile Machinery (NRMM).	This major piece of work is ongoing through working with partner boroughs and the Greater London Authority. Details provided against Action 38. Continue to deliver and implement the Pan London NRMM Low Emission Zone. Delivered many training events to industry stakeholders. Presented at numerous Air Quality events for the Greater London Authority, City of London, Air Quality Cluster Groups and other stakeholders.
59	Anti-idling to be adopted as an enforcement action in the borough with associated signage in problem areas.	Prior to 2022 over 200 anti-idling signs were installed in the borough at schools, level crossings and taxi ranks. A further 37 No Idling signs were installed in 2022 following a comprehensive review of idling complaints received by the Pollution Team. An Anti-Idling Action Plan (AIAP) was created in 2021, the plan covers internal and external partner engagement, communications, signage and events. The plan delivers at least one idling event each month. Events are primarily delivered by Air Quality Officers and focus on idling hotspots such as level crossings and schools but also in response to complaints. Nine anti-idling events were delivered during 2022, 5 of those events took place at level

		crossings in the borough and 4 events took place around school sites. The AIAP is a live document and continues to be implemented in 2023. The final Idling Action London workshop associated with the pan-London Mayor of London funded projected which concluded in March 2022 was delivered at Merton Abbey Primary School. Behavioural Insights project to investigate the impact that active signage had on idling vehicles queuing at West Barnes Lane Level Crossing was successfully delivered in 2022. The sign was installed in June 2022 and was found to have a statistically significant impact on the number of drivers turning off their engine whilst waiting at the barrier. Air Quality Officers dedicated a total of 40 hours collecting idling vehicle data at West Barnes Level Crossing. Data was collected before the sign was installed and following the installation of the sign. Before the sign was in place, 37% of drivers turned their engine off. After the sign was in place, 50% of drivers turned their engine off. • The message is 'save money, save fuel, turn off your engine'. • In this scenario; an active LED sign conveying a message of salience, self-interest and awareness raising effectively reduces idling. • The full project report is published on the LGA website: https://www.local.gov.uk/case-studies/using-behavioural-insights-improve-air-quality-london-borough-merton

		The Merton Council Nudges for Social Good podcast is live at: https://www.local.gov.uk/our-support/behavioural-insights/nudges-social-good-our-behavioural-insights-podcast The transcript is live at https://www.local.gov.uk/our-support/behavioural-insights/nudges-social-good-our-behavioural-insights-podcast/podcast-1
60	Start partnership working with the GLA and surrounding boroughs on anti-idling campaigns.	Following the end of the pan-London Idling Action project in March 2022 which was funded by the Mayors Air Quality Fund. A small legacy group was set-up in September 2022. The group meets quarterly to maintain the Idling Action London website and to support Councils to take action to reduce idling in their borough. It is also a platform to share best practice such as the results of Merton's Behavioural Insights project which investigated idling signage at a level crossing in the borough.
61	Work with neighbouring boroughs to consider tighter restrictions on bonfires.	Ongoing: Considering options and lobbying for greater powers. There is political reluctance to introducing new bye laws to tackle bonfires. We are instead using lobbying powers for new Clean Air Act to cover all domestic burning, both indoors and outdoors.
62	Conduct campaigns relating to wood burning appliances and seek additional funding from DEFRA to carry out an	We continue to lobby for tighter regulations on wood burning appliances. DEFRA funding secured in 2022 following an unsuccessful in in 2020 for a Wood Burning project – refer to NP2: 2022 at the end of Table J for details.

	impact assessment and explore further controls	
62	Deliver cleaner construction throughout London through our Non Road Mobile Machinery (NRMM) project and extend this nationally.	In London the NRMM project is funded by Mayors Air Quality Fund (MAQF) / Greater London Authority (GLA) and match funding from participating London Boroughs. The 2019-2022 End of Project report has been submitted to the GLA with encouraging outcomes which have been quantified. This Pan-London Project has been successfully extended to 2024/25. The London NRMM project operates as Cleaner Construction for London (CCFL) the CCFL scheme, which has been running since 2016, allows for the machinery to be removed from site or work to be stopped until equipment compliant with local air quality standards is brought in. The team of six has picked up two national awards for their work, and there are plans to roll out the scheme across the country following on from its successful launch, with local authorities as far north as Bradford interested in emulating their work. Over the last three years, the scheme has contributed to the prevention of approximately 72 tonnes of particulate matter, 1,600 tonnes of oxides of nitrogen (NOx) and 80,700 tonnes of carbon dioxide, equivalent in NOx savings to a 15% reduction in the number of HGVs in London or a 41% reduction in the number of taxis.
64	Assess and inspect newly installed CHPs to ensure	Not progressed during 2022. There is no resource available to perform this function.

	compliance with planning conditions.	
65	Maintain our ongoing commitment to school travel plans and the STARS review.	No additional updates. A Healthy Streets Officer was employed by Sustrans and Transport for London on a fixed term basis, with the contract ending in June 2022 There has been a reduced programme in 2020 and 2021 due to schools being closed due to the pandemic and restrictions on activities such as cycle training. However physical measures including installing cycle parking at 16 schools and School Streets at 25 schools have been progressed instead. See Action 69. Of the 105 institutions (including nursery, primary and secondary) listed on the Edubase database the accreditation split is as follows: Gold: 14 Silver: 4 Bronze: 13 Engaged: 1 Not engaged: 74 Some of the institutions listed with an EAN number will not have or chose to have a STARS School Travel Plan.

66	Carry out audits of schools in the most polluted areas of the borough and help provide a scheme of mitigation where necessary and possible.	Ongoing: Based on the results of a 12-month air quality monitoring programme using nitrogen dioxide diffusion tubes, 9 school sites were added to the Council's main diffusion tube network in January 2021 and continued to be monitored in 2022. These schools were prioritised to receive an Air Quality Audit (AQA) however, not all schools identified took up the offer of an AQA and the offer was extended to all schools. In 2022, 18 schools were contacted in 2022 for an air quality audit however no school took up the offer. Desktop audits are in the pipeline for 2023 for the schools that do not engage.
67	Review and assess annually the necessity for audits at schools and nurseries in areas subject to high levels of pollution.	Ongoing. Nine schools were incorporated into the main council diffusion tube network in 2021 and are continued to be monitored. Monitoring data for these sites are included in Table D. The annual mean air quality objective for nitrogen dioxide was not exceeded at any school site in 2022.
68	Incorporate schools in areas of poor air quality into our monitoring network and regime.	Completed. Nine schools were incorporated into the main council diffusion tube network in 2021 and are continued to be monitored. Monitoring data for these sites are included in Table D. The annual mean air quality objective for nitrogen dioxide was not exceeded at any school site in 2022.

69	Joint working arrangements with Public Health partners around schools to deliver joint health benefits.	Over 2022/23 Public Health has secured three grants for three primary schools to participate in the GLA School superzone programme. Merton Abbey Primary School began its active Travel Pilot in May 2022, and will complete in June 2023 with the intention of introducing a school wide behaviour change to eliminate all car journeys for the school run. Abbotsbury Primary began its safer travel / after school play space pilot in February 2023 and will complete in 2024. This pilot will focus the pupil's needs for safe passage to and from school via their local park, to redesign the Central Road to be child friendly. St Mark's Primary began its pilot in January 2023 and will be completed in 2024. This pilot is focused on reducing the threat of harm and hazards faced by the students, parents and staff on the school run. This has resulted in a steering group of multidisciplinary teams to meet regularly to synchronise all council efforts to improve safety.
		No additional update. The operation of three School Streets commenced in 2019. At the time of writing this report, Merton is one of London boroughs with the most school streets with some 30 active locations: https://www.merton.gov.uk/streets-parking-transport/traffic-management/school-streets-programme
70	Work with and provide specialist advice and support to schools around air quality issues.	Ongoing: The Air Quality Team is available to advise schools on how to improve air quality and signpost schools to air quality information and funding opportunities. The most effective delivery of this is through an Air Quality Audit.

NP1:2021	Clean Air Villages 4 (CAV4)	Funding awarded by DEFRA. Active dates May 2021 – June 2022. Delivery of a Clean Air Village in Wimbledon Town Centre 2021/22. Building on the business engagement exercise in 2020/21 a cargo bike courier service was procured in late 2021 for delivery of a free 120 hour trial for businesses in Wimbledon. As part of the Clean Air Villages 4 (CAV4) programme, Merton Council, Love Wimbledon, Cross River Partnership (CRP) and cargo bike provider XeroE officially launched a free cargo bike and delivery service for local businesses near Wimbledon Town Centre on Monday 9th May 2022 on The Piazza, Wimbledon. The partner organisations showcased the cargo bike to local businesses during the launch and there was even an appearance from a special guest. Local resident Womble Orinoco showed his support for the scheme, which aims to show businesses the ease of switching to cargo bikes for their deliveries and adopting a more sustainable future, whilst also saving costs Following the pilot, CRP calculated emission savings with their in-house measureBEST tool which resulted in the following values:(Emission savings during the trial & based on the total distance of 570.20 km; used off-peak values for calculations.) Emission savings of using a cargo bike instead of an LGV during this trial: • 103.84 kg of CO_2

		• 291.56 g of NO_x • 14.3 g of $PM_{2.5}$ • 24.86g of PM_{10} https://crossriverpartnership.org/wp-content/uploads/2022/07/CAV4-Case-Study-Merton-Cargo-Bike-Business-Engagement-web-document-12.pdf
NP1: 2022		In 2022 Merton commissioned a review of the differing services and messaging networks available across London relating to respiratory illness. Including Air Quality data, reach and EDI. The project involved: • Partner engagement with boroughs, GLA & Public Health to understand the client requirements and potential partner participations, including some 50 partners. • Coordination of partner and client requirements for a unified notification system. • Research into client uptake of a new messaging service and feedback to partners. • Scoping for any legal and data issues (in conjunction with the project manager) • Outline the potential IT and comms opportunities including Apps, social media and messaging. • Outline cost proposals for a new messaging service and achieve where possible future partner participation or sign-up from partners. Costs to include annual subscriptions. • Produce a project plan for the potential rollout of this scheme.

		It was hoped that further funding would be secured from Defra in late 2022 to build upon the initial findings, however the bid was unsuccessful.
NP2: 2022	Wood Burning Research and Behaviour Change Project	Funding awarded by DEFRA. Active dates April 2022 – March 2024. The Council understand that solid fuel burning is a major source of $PM_{2.5}$ that must be controlled at the local level. Domestic burning is the second largest contributor to $PM_{2.5}$ in Merton after road transport at 25%. Addressing this source is crucial for achieving the WHO guideline levels for $PM_{2.5}$ by 2030. The Pollution Team investigate all domestic Smoke Control related complaints. Merton is part of the GLA engagement group on wood burning and is a participating London local authority in the 2021 joint Defra bid on burning. Meetings were held during 2022 and in Autumn/Winter 2022, the group appointed Imperial College London to evaluate all types of internal wood and solid fuel burning. This involved monitoring inside and outside homes burning a variety of different fuels in various appliances. Data has been collected which will be used to assess impacts on human health. This will then inform a pan London media campaign in Winter 2023/24 to raise awareness of health impacts for internal burning.

3. Planning Update and Other New Sources of Emissions

Table K. Planning requirements met by planning applications in the London Borough of Merton 2022

Condition	Number
Number of planning applications where an air quality impact assessment was reviewed for air quality impacts	20
Number of planning applications required to monitor for construction dust	3
Number of CHPs/Biomass boilers refused on air quality grounds	0
Number of CHPs/Biomass boilers subject to GLA emissions limits and/or other restrictions to reduce emissions	2
Number of developments required to install Ultra-Low NO_x boilers	1
Number of developments where an AQ Neutral building and/or transport assessments undertaken	16
Number of developments where the AQ Neutral building and/or transport assessments not meeting the benchmark and so required to include additional mitigation	1
Number of planning applications with S106 agreements including other requirements to improve air quality	Tree Planting x1 Car Club x3 Cycle Provision x2 Walkway Contribution (new type) x1
Number of planning applications with CIL payments that include a contribution to improve air quality	Under the CIL Regulations 2010 CIL expenditure is not accounted for at the planning application level. It's a fundamental part of CIL, it will never change for as long as CIL lasts.
NRMM: Central Activity Zone , Canary Wharf and Opportunity Areas Number of conditions related to NRMM included. Number of developments registered and compliant. Number of audits % of sites unregistered prior to audit Please include confirmation that you have checked that the development has been registered with the GLA through the relevant NRMM website and that all NRMM used on-site is compliant with Stage Stage IV of the Directive and/or exemptions to the policy.	The London Borough of Merton is entirely outside of the Central Activity Zone and Canary Wharf
NRMM: Greater London (excluding Central Activity Zone, Canary Wharf and Opportunity Areas) Number of conditions related to NRMM included. Number of developments registered and compliant. Number of audits % of sites unregistered prior to audit	NRMM condition recommended to be attached to all planning applications where construction and demolition is proposed (20). Cleaner Construction for London undertook 16 site audit(s) in the borough of Merton.

Condition	Number
Please include confirmation that you have checked that the development has been registered at www.nrmm.london and that all NRMM used on-site is compliant with Stage IIIB of the Directive and/or exemptions to the policy.	• 2 site(s) achieved Self-Compliant status • 9 site(s) worked towards and achieved Compliance • 1 site(s) failed and were recorded as non-Compliant. • 4 site(s) had No NRMM within scope (37-560kW) presently deployed. • 56% of sites audited were cold engaged and therefore not registered prior to auditing. • 44% of sites audited were not cold engaged and therefore not registered prior to auditing.

NRMM condition recommended to be attached to all planning applications where construction and demolition is proposed.

NRMM is a standard planning condition applied to all major developments.

All major developments are passed to the Air Quality Officers in the Pollution Team for comment. All major developments are required to submit an AQA. All relevant national, Mayoral and Merton local policies are applied by the Pollution Team to all relevant planning consultations. Sites are considered for construction dust on a case-by-case basis, particulate matter (PM_{10}) monitoring required and locations agreed, where a moderate or high risk to receptors are identified. CHP/biomass are not recommended and actively discouraged, developers are urged to select non-combustion or at least ultra-low NOx heating systems. We are observing over time that more developments are proposing non-combustion, maximum insulation and renewables to increase BREEAM ratings. The largest contribution to emissions from development coming from transport and not buildings.

3.1 New or significantly changed industrial or other sources

No new sources identified.

4. Additional Activities to Improve Air Quality

4.1 London Borough of Merton Fleet

No additional update.

4.2 NRMM Enforcement Project

The London Borough of Merton is continuing to support the NRMM Enforcement project in 2023 – 24.

4.3 Air Quality Alerts

The London Borough of Merton continues to support *air*TEXT (https://www.airtext.info/). It is however clear from pilot work carried out by the Regulatory Services Partnership that there is a clear gap in information about local and internal air quality and the impact on the vulnerable. We coordinated a DEFRA bid on behalf of 15 London Boroughs, but this was not successful. It is anticipated that this work will be picked up locally by the borough in mid-2023 and coordinated though Public Health and comms.

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Appendix A Details of Monitoring Site Quality QA/QC

A.1 Automatic Monitoring Sites

All data undergoes quality assurance and quality control (QA/QC) procedures to ensure that the data obtained are of a high quality. Automatic monitoring took place over the full 12-month period in 2022, however, during the annual data ratification process in May 2022 due to ongoing issues with the monitoring equipment, a portion of the data was void reducing the valid data captures for 2022.

In 2022 there were challenges maintaining equipment and sourcing technical components and calibration gases. There has been considerable resourcing allocated to refreshing the network in 2023, which will include $PM_{2.5}$ monitoring.

The NO_2 continuous analyser is automatically calibrated every night and also manually checked and calibrated every two to four weeks by the contractor, TRL, employed by the London Borough of Merton for Local Support Officer (LSO) visits during 2022. There is a need for frequent calibration adjustments as the gradual build-up of dirt within the analyser reduces the response rate. This fall off in response needs appropriate correction, to ensure the recording of the true concentrations. The calibration process involves checking the monitoring accuracy against a known concentration of span gas. The span gas used is nitric oxide and is certified to an accuracy of 5%. Both the automatic and manual calibrations use this same certified span gas (i.e. the automatic overnight one does not use the less accurate permeation tube method).

The NO_2 continuous analysers is serviced every six months by TRL and audited by the National Physical Laboratory (NPL) every six months as part of Environmental Research Groups (ERG) - Imperial College London's, London Air Quality Network (LAQN) QA/QC procedure, to ensure optimum data quality.

PM_{10} Monitoring Adjustment

PM_{10} particulates are measured using a Tapered Element Oscillating Microbalance (TEOM) analyser, with the data presented as the gravimetric equivalent.

No automatic or fortnightly calibrations are carried out on the TEOM. Calibrations are only carried as part of the routine servicing and regular independent audits. The

on-going performance of the monitor is checked online, by the ERG - Imperial College London Duty Officer. The role of the LSO at the fortnightly visits is to make more detailed performance checks. The LSO is also on standby at other times, to change the TEOM's monitoring filter as required, depending on the filter loading.

Since 2009, TEOM data have been improved by routine adjustments, using the volatile correction method (VCM). This corrects for the loss of any volatile mass, which has been driven off by the heat applied in the TEOM's inlet column. The VCM adjustments are carried out by Imperial College London, prior to dissemination of the data.

The TEOM equipment is serviced every six months by TRL and also audited by NPL every six months as part of the Imperial LAQN QA/QC procedure, to ensure optimum data quality. Both sites are part of the LAQN and ERG are responsible for the daily data collection, storage, validation and dissemination via the LAQN website (www.londonair.org.uk). ERG ratifies the data periodically, viewing data over longer time periods and using the results from fortnightly checks, equipment services and equipment audits.

A.2 Diffusion Tubes

Directive 2008/50/EC of the European Parliament and of the Council on ambient air quality and cleaner air for Europe (EC, 2008) sets air quality objectives for NO_2 along with other pollutants. Under the Directive, annual mean NO_2 concentration data derived from diffusion tube measurements must demonstrate an accuracy of ±25 % to enable comparison with the NO_2 air quality objectives of the Directive.

In order to ensure that NO_2 concentrations reported are of a high quality, strict performance criteria need to be met through the execution of QA and QC procedures. A number of factors have been identified as influencing the performance of NO_2 diffusion tubes including the laboratory preparing and analysing the tubes, and the tube preparation method (AEA, 2008). QA and QC procedures are therefore an integral feature of any monitoring programme, ensuring that uncertainties in the data are minimised and allowing the best estimate of true concentrations to be determined.

Our NO_2 diffusion tubes are analysed for us by Gradko using 50% TEA in acetone method of preparation. Gradko take an active role in developing rigorous QA and QC procedures in order to maintain the highest degree of confidence in their laboratory measurements. Gradko were involved in the production of the Harmonisation Practical Guidance for NO_2 diffusion tubes (AEA, 2008) and have been following the procedures set out in the guidance since January 2009. Since April 2014 Gradko has taken part in a new scheme AIR-PT, which combines two long running PT schemes: LGC Standards STACKS PT scheme and HSL WASP PT scheme.

This section contains details of Gradko International Ltd.'s Results of laboratory precision

- Performance in AIR NO2 PT Scheme (May 2020 – June 2022)

- Summary of Precision Scores for 2020 – 2022

- UKAS schedule of accreditation (December 2022)

Gradko International Ltd is a UKAS accredited laboratory and participates in laboratory performance and proficiency testing schemes. These provide strict performance criteria for participating laboratories to meet, thereby ensuring NO_2 concentrations reported are of a high calibre.

Summary of Laboratory Performance in AIR NO2 Proficiency Testing Scheme (May 2020 – June 2022)

Gradko participate in the AIR PT NO_2 diffusion tube scheme, which uses artificially spiked diffusion tubes to test each participating laboratory's analytical performance on a quarterly basis. The scheme is designed to help laboratories meet the European Standard. Gradko demonstrated "good" laboratory performance in 2022 for 50% TEA in Acetone.

The laboratory follows the procedures set out in the Harmonisation Practical Guidance and participates in the AIR proficiency-testing (AIR-PT) scheme. Previously to the Air-PT scheme, Gradko participated in the Workplace Analysis Scheme for Proficiency (WASP) for NO2 diffusion tube analysis. Defra and the Devolved Administrations advise that diffusion tubes used for LAQM should be

obtained from laboratories that have demonstrated satisfactory performance in the AIR-PT scheme.

Laboratory performance in the AIR-PT is also assessed by the National Physical Laboratory (NPL), alongside laboratory data from the monthly NPL Field Inter-Comparison Exercise carried out at for Gradko at Marylebone Road, central London. A laboratory is assessed and given a 'z' score, a score of ± 2 or less indicates satisfactory laboratory performance.

Participation in a single round of an external proficiency-testing scheme represents a "snap-shot" in time of a laboratory's analytical quality. It is more informative therefore to consider performance over several rounds. Following on from above, therefore over a rolling five round AIR PT window, one would expect that 95 % of laboratory results should be $\leq \pm 2$. If this percentage is substantially lower than 95 % for a particular laboratory, within this five round window, then one can conclude that the laboratory in question has significant sources of error within their analytical procedure.

From the most recent laboratory performance data available, the five round window to used to assess Gradko International Ltd.'s performance is covered by rounds AR043 (May-June 2021), AR045 (July-August 2021), AR046 (September-October 2021), AR049 (January-February 2022) and AR050 (May-June 2022) of the AIR-PT scheme. During this time 100% of the results submitted by Gradko were determined to be satisfactory.

Table 1: Laboratory summary performance for AIR NO_2 PT rounds AR037, 39, 40, 42, 43, 45, 46, 49 and 50

The following table lists those UK laboratories undertaking LAQM activities that have participated in recent AIR NO_2 PT rounds and the percentage (%) of results submitted which were subsequently determined to be **satisfactory** based upon a z-score of $\leq \pm 2$ as defined above.

AIR PT Round	AIR PT AR037	AIR PT AR039	AIR PT AR040	AIR PT AR042	AIR PT AR043	AIR PT AR045	AIR PT AR046	AIR PT AR049	AIR PT AR050
Round conducted in the period	May – June 2020	July – August 2020	September – October 2020	January – February 2021	May – June 2021	July – August 2021	September – October 2021	January – February 2022	May – June 2022
Aberdeen Scientific Services	NR [4]	NR [4]	100 %	100 %	100 %	100 %	100 %	100 %	100 %
Cardiff Scientific Services	NR [4]	NR [4]	NR [3]	NR [3]	NR [3]	NR [3]	NR [3]	NR [3]	NR [3]
Edinburgh Scientific Services	NR [4]	NR [4]	100 %	25 %	100 %	100 %	75 %	NR [2]	50 %
SOCOTEC	NR [4]	NR [4]	100 % [1]	100 % [1]	100 % [1]	87.5 % [1]	100 % [1]	100 % [1]	100 % [1]
Exova (formerly Clyde Analytical)	NR [4]	NR [4]	NR [3]	NR [3]	NR [3]	NR [3]	NR [3]	NR [3]	NR [3]
Glasgow Scientific Services	NR [4]	NR [4]	100 %	50 %	100 %	100 %	NR [2]	100 %	100 %
Gradko International	NR [4]	NR [4]	75 %	25 %	100 %	100 %	100 %	100 %	100 % [1]
Kent Scientific Services	NR [4]	NR [4]	NR [3]	NR [3]	NR [3]	NR [3]	NR [3]	NR [3]	NR [3]
Kirklees MBC	NR [4]	NR [4]	NR [3]	NR [3]	NR [3]	NR [3]	NR [3]	NR [3]	NR [3]
Lambeth Scientific Services	NR [4]	NR [4]	100 %	100 %	100 %	75 %	75 %	50 %	75 %
Milton Keynes Council	NR [4]	NR [4]	25 %	0 %	50 %	100 %	100 %	75 %	100 %
Northampton Borough Council	NR [4]	NR [4]	NR [3]	NR [3]	NR [3]	NR [3]	NR [3]	NR [3]	NR [3]
Somerset Scientific Services	NR [4]	NR [4]	100 %	100 %	100 %	100 %	100 %	75 %	100 %
South Yorkshire Air Quality Samplers	NR [4]	NR [4]	100 %	100 %	75 %	100 %	100 %	NR [2]	NR [2]
Staffordshire County Council	NR [4]	NR [4]	50 %	100 %	100 %	100 %	100 %	100 %	100 %
Tayside Scientific Services (formerly Dundee CC)	NR [4]	NR [4]	100 %	NR [2]	100 %	NR [2]	100 %	NR [2]	NR [2]
West Yorkshire Analytical Services	NR [4]	NR [4]	NR [3]	NR [3]	NR [3]	NR [3]	NR [3]	NR [3]	NR [3]

[1] Participant subscribed to two sets of test results (2 x 4 test samples) in each AIR PT round.
[2] NR, No results reported.
[3] Cardiff Scientific Services, Exova (formerly Clyde Analytical), Kent Scientific Services, Kirklees MBC, Northampton Borough Council and West Yorkshire Analytical Services; no longer carry out NO2 diffusion tube monitoring and therefore did not submit results.
[4] Round was cancelled due to pandemic.

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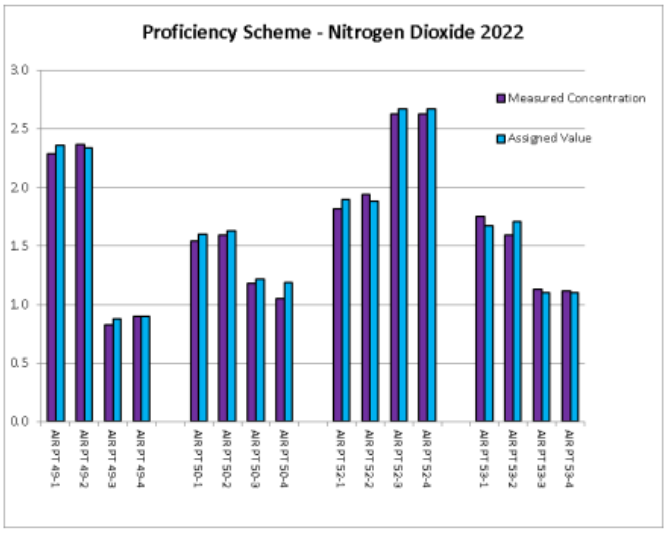
AIR PT Nitrogen Dioxide Proficiency Scheme Results 2022

Methods: GLM 7 – CARY 60 Spectrophotometer

AIR PT Proficiency Scheme - Nitrogen Dioxide 2022					
Date	Round	Assigned value	Procedure GLM 7		
			Measured concentration	z-Score	% Bias
Feb-22	AIR PT 49-1	2.36	2.29	-0.4	-3.0%
Feb-22	AIR PT 49-2	2.34	2.37	0.2	1.3%
Feb-22	AIR PT 49-3	0.88	0.83	-0.65	-5.7%
Feb-22	AIR PT 49-4	0.9	0.9	0.0	0.0%
May-22	AIR PT 50-1	1.6	1.54	-0.5	-3.8%
May-22	AIR PT 50-2	1.63	1.59	-0.29	-2.5%
May-22	AIR PT 50-3	1.22	1.18	-0.44	-3.3%
May-22	AIR PT 50-4	1.19	1.05	-1.48	-11.8%
Aug-22	AIR PT 52-1	1.90	1.82	-0.56	-4.2%
Aug-22	AIR PT 52-2	1.88	1.94	0.43	3.2%
Aug-22	AIR PT 52-3	2.67	2.63	-0.2	-1.5%
Aug-22	AIR PT 52-4	2.67	2.63	-0.2	-1.5%
Oct-22	AIR PT 53-1	1.67	1.75	0.64	4.8%
Oct-22	AIR PT 53-2	1.71	1.59	-0.94	-7.0%
Oct-22	AIR PT 53-3	1.1	1.13	0.36	2.7%
Oct-22	AIR PT 53-4	1.1	1.12	0.24	1.8%



Precision Summary Results

The diffusion tube precision summary results are provided below. This details the total number of recorded good/bad precision results for the last 3 years for laboratories that currently provide diffusion tube analysis.

2020 - 2022 Summary of Precision Results for Nitrogen Dioxide Diffusion Tube Collocation Studies UK Laboratories including for Gradko Laboratory 50% TEA in Acetone

Diffusion Tube Preparation Method	2020 Good	2020 Bad	2021 Good	2021 Bad	2022 Good	2022 Bad
Gradko, 50% TEA in Acetone	19	1	16	0	14	0
Gradko, 20% TEA in Water	27	0	34	0	27	0
ESG Didcot / SOCOTEC, 50% TEA in Acetone	24	0	25	3	26	0
ESG Didcot / SOCOTEC, 20% TEA in Water	6	0	14	1	5	0
Staffordshire Scientific Services	15	0	15	1	12	0
Glasgow Scientific Services	2	7	2	5	3	3
Edinburgh Scientific Services	4	1	6	0	1	0
Milton Keynes Council	4	0	4	0	1	0
Tayside Scientific Services	1	0	1	0	1	0

2020 - 2022 Summary of Precision Results for Nitrogen Dioxide Diffusion Tube Collocation Studies UK Laboratories including for Gradko Laboratory 50% TEA in Acetone

Diffusion Tube Preparation Method	2020 Good	2020 Bad	2021 Good	2021 Bad	2022 Good	2022 Bad
Lambeth Scientific Services	8	2	8	1	3	1
Aberdeen Scientific Services	7	0	7	0	7	0
South Yorkshire Air Quality Samplers	1	0	1	0	0	0
ESG Glasgow, 50% TEA in Acetone	1	0	0	1	1	0
ESG Glasgow, 20% TEA in Water	1	0	0	1	1	0
Somerset County Council	10	0	11	0	6	0

Numerical results for this data are contained in the National Bias Adjustment Spreadsheet version 03/23

In 2022, the tube precision for NO_2 Annual Field Inter-Comparison for Gradko International using the 50% TEA in acetone method was 'good' for the results of 14 participating local authorities, no participating local authorities were deemed to be 'bad'.

Analysed by	Method	Year	Site Type	Local Authority	Legnth of study (months)	Diffusion tube mean conc. (Dm) (ug/m3)	Automatic monitor (Cm) (ug/m3)	Bias (B)	Tube Precision	Bias adjustment factor (A) (Cm/Dm)
Gradko	50% TEA in Acetone	2022	KS	Adur District Council	10	30	21	42.9%	G	**0.70**
Gradko	50% TEA in Acetone	2022	UC	Falkirk Council	12	32	26	22.7%	G	**0.81**
Gradko	50% TEA in Acetone	2022	UB	Falkirk Council	9	15	13	16.4%	G	**0.86**
Gradko	50% TEA in Acetone	2022	R	Lb Newham	12	30	23	29.1%	G	**0.77**
Gradko	50% TEA in acetone	2022	SU	Redcar & Cleveland Borough Council	12	14	10	44.9%	G	**0.69**
Gradko	50% TEA in Acetone	2022	R	Worthing Borough Council	9	33	23	44.2%	G	**0.69**
Gradko	50% TEA in acetone	2022	KS	Marylebone Road Intercomparison	12	52	42	23.0%	G	**0.81**
Gradko	50% TEA in acetone	2022	R	City Of London	11	60	54	11.6%	G	**0.90**
Gradko	50% TEA in acetone	2022	UB	City Of London	12	28	23	23.7%	G	**0.81**
Gradko	50% TEA in Acetone	2022	KS	London Borough Of Croydon	12	41	37	11.1%	G	**0.90**
Gradko	50% TEA in Acetone	2022	R	Royal Borough Of Windsor And Maidenhead	12	30	26	13.9%	G	**0.88**
Gradko	50% TEA in Acetone	2022	R	Royal Borough Of Windsor And Maidenhead	12	27	27	-1.0%	G	**1.01**
Gradko	50% TEA in Acetone	2022	R	Sandwell Mbc	12	34	27	27.1%	G	**0.79**
Gradko	50% TEA in Acetone	2022	UB	Sandwell Mbc	12	21	19	11.9%	G	**0.89**
Gradko	50% TEA in acetone	2022		**Overall Factor[3] (14 studies)**				**Use**		**0.82**

Schedule of Accreditation issued by United Kingdom Accreditation Service (UKAS)

Gradko is accredited by UKAS for the analysis of NO_2 diffusion tubes. It undertakes the analysis of the exposed diffusion tubes by ultra-violet spectrophotometry. The relevant test is shown below on the UKAS Schedule of Accreditation issued 19 December 2022.

Schedule of Accreditation
issued by
United Kingdom Accreditation Service
2 Pine Trees, Chertsey Lane, Staines-upon-Thames, TW18 3HR, UK

UKAS TESTING
2187

Accredited to ISO/IEC 17025:2017

Gradko International Ltd
(Trading as Gradko Environmental)

Issue No: 025 **Issue date:** 19 December 2022

St Martins House 77 Wales Street Winchester Hampshire SO23 0RH	Contact: Mr A Poole Tel: +44 (0)1962 860331 Fax: +44 (0)1962 841339 E-Mail: diffusion@gradko.co.uk Website: www.gradko.co.uk

Testing performed at the above address only

DETAIL OF ACCREDITATION

Materials/Products tested	Type of test/Properties measured/Range of measurement	Standard specifications/ Equipment/Techniques used
	Nitrogen Dioxide as nitrite (NO_2^-)	GLM 7 by Colorimetric determination (UV Spectrophotometry)

NO_2 diffusion tube analysis method

NO_2 diffusion tubes are passive monitoring devices. They are made up of a Perspex cylinder, with two stainless steel mesh discs, coated with triethanolamine (TEA) absorbent held inside a polythene cap, which is sealed onto one end of the tube. Diffusion tubes operate on the principle of molecular diffusion, with molecules of a gas diffusing from a region of high concentration (open end of the tube) to a region of low concentration (absorbent end of the tube) (AEA, 2008). NO_2 diffuses up the tube because of a concentration gradient and is absorbed by the TEA, which is present on the coated discs in the sealed end of the tube. All of Merton's NO_2 diffusion tubes are prepared by Gradko using 50% v/v TEA with Acetone as the absorbent.

Prior to and after sampling, an opaque polythene cap is placed over the end of the diffusion tube opposite the TEA coated discs to prevent absorption. The NO_2 diffusion tubes are labelled and kept refrigerated in plastic bags prior to and after exposure.

In the laboratory, the steel mesh is removed and washed with distilled water which is then analysed. The concentration of nitrogen dioxide is found by shining ultraviolet light (UV) through the water sample. The amount of light absorbed is equivalent to the concentration of nitrogen dioxide that was present in the air during the monitoring period.

Discussion of Choice of Factor to Use

In 2022 the Borough undertook a co-location study placing with three NO_2 diffusion tubes (Site IDs 47, 47/2, 47/3) with the continuous NO_2 monitoring equipment at the Civic Centre Morden (ME9).

However, it was not possible to derive the local bias adjustment factor for 2022 as Environmental Research group (ERG) were unable to validate the measurements from ME9. As such the national bias adjustment factor of 0.82[2] has been used to correct diffusion tube data. The guidance states, the use of nationally derived bias adjustment factor will provide the best estimate of the true annual mean concentration as it is based on more studies than a locally derived one.

Table L. Bias Adjustment Factor

Year	Local or National	If National, Version of National Spreadsheet	Adjustment Factor
2022	National	03/23	0.82
2021	National	03/22	0.83
2020	National	03/21	0.82
2019	Local	03/20	0.89
2018	National	03/19	0.92
2017	National	03/18	0.97
2016	National	03/17	1.03

[2] National Diffusion Tube Bias Adjustment Factor Spreadsheet. Spreadsheet Version Number 03/23.

2015	National	03/16	0.96
2014	National	03/15	0.80

A.3 Adjustments to the Ratified Monitoring Data

Short-term to Long-term Data Adjustment

NO_2 Adjustment (Diffusion tube Site ID 51)

Data adjustment (annualisation) was required for one diffusion tube monitoring location, Site ID 51 as the data capture rate was 67% in 2022. Annualisation is required when data capture falls below 75%. The results are also provided in Table M.

NO_2 Adjustment (Automatic Site ME9)

The automatic monitoring data are subject to correction by the Environmental Research Group (ERG) at Imperial College London as part of the London Air Quality Network (LAQN). Automatic monitoring took place over the full 12-month period in 2022, however, during the annual data ratification process in May 2022 due to ongoing issues with the monitoring equipment, a portion of the data was void reducing the valid data capture to 69% for 2022.

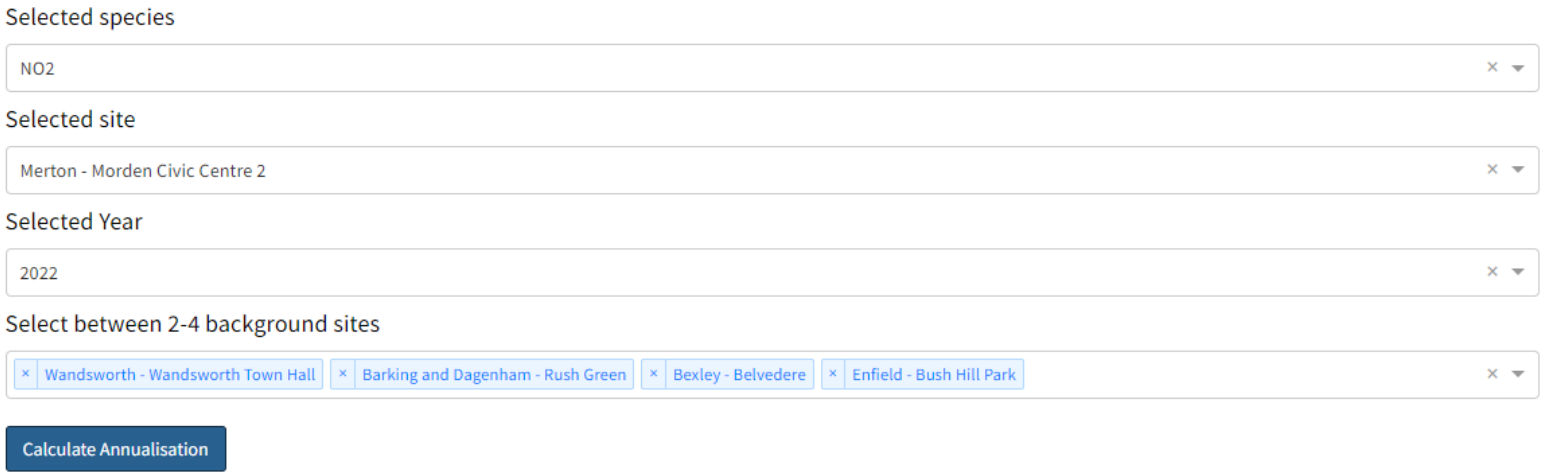
Data was annualised using the LondonAir web tool as described below. Link to LAQN webpage: https://www.londonair.org.uk/LondonAir/latools/Annualisation.aspx?sitecode=ME9&year=2022&species=no2. The results are also provided in Table M.

It is not always possible to measure for a whole year to obtain an annual mean for a pollutant. Sometimes instrument faults or problems with data quality can also lead to missing data and a full year's measurements are not achieved. Defra technical guidance (TG16, Feb 18) provides a method for estimating an annual mean that should be used if available data capture is below 75%. This process is termed annualising.

The tool below allows you to do this for any LondonAir measurement site. Simply select the measurement site and period that you wish to annualise and then select between two and four nearby background measurement sites to act as a reference for the annualisation. The tool matches available measurements from the site being annualised with measurements from each background site to produce a ratio. TG16 provides the following guidance on the choice of reference sites for the annualisation,

"Identify two to four nearby, long-term, continuous monitoring sites... The data capture for each of these sites should be at least 85%. These sites should be background (Urban Background, Suburban or Rural) sites to avoid any very local effects that may occur at Urban Centre, Roadside or Kerbside sites, and should, wherever possible lie within a radius of about 50 miles."

This annualisation tool only selects background sites with at least 85% data capture for the corresponding year for use in the calculation.



Original Annual Mean	Annualisation Factor	Annualised Mean
34	1.126	38.3

Background Site	Annual Mean	Period Mean	Ratio
Barking and Dagenham - Rush Green	16.8	13.3	1.262
Bexley - Belvedere	15.9	14.4	1.106
Enfield - Bush Hill Park	18.8	17.2	1.095
Wandsworth - Wandsworth Town Hall	27.8	26.7	1.042

PM_{10} Automatic Site Adjustment (ME2)

Data capture for the automatic analyser ME2 in 2022 was 36% and as such data adjustment (annualisation) was required. Data was annualised using the LondonAir web tool as described for the NO_2 adjustment at ME9 above. Link to LAQN webpage: https://www.londonair.org.uk/LondonAir/latools/Annualisation.aspx?sitecode=ME2&year=2022&species=pm10. The results are also provided in Table M.

Selected species

PM10

Selected site

Merton - Merton Road

Selected Year

2022

Select between 2-4 background sites

Wandsworth - Putney | Richmond Upon Thames - Barnes Wetlands | Barking and Dagenham - Scrattons Farm | Islington - Arsenal

Calculate Annualisation

Original Annual Mean	Annualisation Factor	Annualised Mean
26	0.951	24.7

Background Site	Annual Mean	Period Mean	Ratio
Barking and Dagenham - Scrattons Farm	18	18.7	0.962
Islington - Arsenal	16.8	17.9	0.941
Richmond Upon Thames - Barnes Wetlands	14.3	15	0.95
Wandsworth - Putney	15.5	16.3	0.949

Distance Adjustment

Where an exceedance has been measured at a monitoring site which is not representative of public exposure, the procedure specified in LLAQM.TG(19) and NO2 fall-off with distance calculator (Version 4.2) Excel tool has been used to estimate the concentration at the nearest receptor. Distance corrected NO2 concentrations are provided in Table N. NO2 Fall off With Distance Calculations.

NO2 fall-off with distance calculator

This Excel tool has been developed to help local authorities derive the NO_2 concentration at locations relevant for exposure as it is not always possible to measure concentrations at precisely the desired location. The calculator allows you to predict the annual mean NO_2 concentration for a location ("receptor") that is close to a monitoring site. The monitoring can either be closer to the kerb than the receptor, or further from the kerb than the receptor. The closer the monitor and the receptor are to each other, the more reliable the prediction will be.

The methodology consists of comparing the monitored annual mean NO_2 concentrations at a given point against known relationships between NO_2 concentrations and the distance from a road source.

Limitations

1. Each distance inputted should be greater than 0.1m and less than 50m (In practice, using a value of 0.1m when the monitoring is closer to the kerb than this is likely to be reasonable).

2. When your receptor is further from the kerb than your monitor, it is recommended that the receptor and monitor should be within 20m of each other.

3. When your receptor is closer to the kerb than your monitor, it is recommended that the receptor and monitor should be within 10m of each other.

4. Distances should be measured perpendicular to the kerb and the calculator assumes that the monitor and receptor have similar elevations.

5. The results of the calculator will have a greater uncertainty than measured data. More confidence can be placed in results where the distance between the monitor and the receptor is small than where it is large.

6. The measurement and the background must be for the same year. The background concentration could come from the national maps published at https://uk-air.defra.gov.uk/data/laqm-background-home , or alternatively from a nearby monitor in a background location.

7. The calculator can only be used where the influence of one road source is present i.e. an increasing distance from a road source in one direction cannot lead to a decreased distance toward a secondary road source

Table M. Short-Term to Long-Term Monitoring Data Adjustment

Site ID	Annualisation Factor Site 1	Annualisation Factor Site 2	Annualisation Factor Site 3	Annualisation Factor Site 4	Average Annualisation Factor	Raw Data Annual Mean (µg m^{-3})	Annualised Annual Mean (µg m^{-3})	Comments
DT 51	0.94	N/A	N/A	N/A	0.94	35.2	33.0	Site 1 Wandsworth - WandsworthTown Hall
ME2	0.962	0.941	0.950	0.949	0.951	26	24.7	Site 1 Barking & Dagenham – Scrattons Farm Site 2 Islington – Arsenal Site 3 Richmond Upon Thames – Barnes Wetlands Site 4 – Wandsworth - Putney
ME9	1.262	1.106	1.095	1.042	1.126	34	38.2	Site 1 Barking & Dagenham- Rush Green Site 2 Bexley – Belvedere Site 3 Enfield - Bush Hill Park Site 4 Wandsworth – Wandsworth Town Hall

Diffusion Tube Site ID 51 Annualisation

Start Date	End date	Wandsworth Town Hall (Urban Background) Continuous Monitor DC for 2022 = 93% (B1)	Barking and Dagenham – Scrattons Farm (B2)	Average of B1 and B2	D1 (Diffusion Tube data)	Average of B1 and B2 when D1 available	Annualised Concentration
07/01/2022	04/02/2022	39.7	35.2	37.5	46.8	37.5	
04/02/2022	04/03/2022	22.3	21.2	21.8	33.3	21.8	

04/03/2022	30/03/2022	34.9	28.3	31.6	32.7	31.6	
30/03/2022	05/05/2022	29.5	18.4	24.0	27.1	24.0	
05/05/2022	06/06/2022	21.7	14.9	18.3	27.1	18.3	
06/06/2022	06/07/2022	19.7	12.0	15.9	Missing		
06/07/2022	05/08/2022	22.1	12.6	17.4	Missing		
05/08/2022	03/09/2022	25.7	14.6	20.2	40.2	20.2	
03/09/2022	28/09/2022	29.2	19.0	24.1	Missing		
28/09/2022	02/11/2022	25.2	22.0	23.6	Missing		
02/11/2022	30/11/2022	25.5	23.9	24.7	35.1	24.7	
30/11/2022	03/01/2023	37.0	27.0	32.0	39.2	32.0	
	Averages	**27.7**	**20.8**	**24.2**	**35.2**	**26.2**	
					Annualisation Ratio	**0.92**	**32.5**

Table N. NO_2 Fall off With Distance Calculations

Site ID	Distance (m): Monitoring Site to Kerb	Distance (m): Receptor to Kerb	Monitored Concentration (Annualised and Bias Adjusted (µg m^{-3})	Background Concentration (µg m^{-3})	Concentration Predicted at Receptor (µg m^{-3})	Comments
1	1.5	16.8	13.6	36.1	24.2	
10	0.3	2.9	13.6	52.3	*38.1*	Predicted concentration at Receptor within 10% the AQS objective.
19	2.5	6.1	13.6	37.8	32.4	
20.0	0.4	5.2	13.6	39.8	28.4	
21 (EA)	0.5	2.4	13.6	51.0	**40.7**	Predicted concentration at Receptor above AQS objective.
22	2.0	6.2	13.6	44.6	*36.4*	Predicted concentration at Receptor within 10% the AQS objective.
23	0.6	2.5	13.6	42.0	34.6	
29 (HA)	0.7	3.3	13.6	41.1	33.1	
34 (GC)	2.0	4.3	13.6	39.3	34.7	
37 (CC)	0.6	3.0	13.6	42.3	33.9	
44 (AA)	0.6	5.5	13.6	52.3	*36.6*	Predicted concentration at Receptor within 10% the AQS objective.
46 (HC)	0.6	5.6	13.6	37.8	27.9	
47	1.5	3.0	13.6	37.3	33.7	
53	0.7	4.3	13.6	41.0	31.6	
54	2.4	4.4	13.6	44.6	**40.0**	Predicted concentration at Receptor above AQS objective.
S68	0.7	18.8	13.6	39.3	23.3	

The background diffusion tube Site ID 31 has been used for the ‘Monitored Concentration’ and has been bias adjusted, annualisation was not required.

For an NO_2 concentration within 10% of the annual mean objective of 40 µgm^{-3} (between 36.0 µgm^{-3} and <40 µgm^{-3}) the concentration is shown in italics.

Exceedances of the NO_2 annual mean objective of 40 µgm-3 are shown in bold.

Appendix B Full Monthly Diffusion Tube Results for 2022

Table O. NO_2 Diffusion Tube Results

Site ID	Valid data capture for monitoring period %[a]	Valid data capture 2022 %[b]	Jan	Feb	Mar	Apr	May	June	Jul	Aug	Sept	Oct	Nov	Dec	Annual mean – raw data	Annual mean – bias adjusted
1	69	69	**48.85**	**42.12**	**48.53**	M	**67.87**	32.03	40	**43.92**	37.49	36.22	**42.72**	**44.48**	**44.0**	36
2 (GA)	92	92	39.66	23.34	36.16	31.66	24.24	20.17	31	M	26.32	28.13	30.45	**40.47**	30.1	25
4 (FA)	92	92	**45.00**	26.70	35.09	29.88	29.17	24.05	34	28.18	34.65	31.37	29.22	36.99	32.0	26
5 (BA)	100	100	M	34.15	34.97	31.34	30.58	22.98	33	29.74	31.85	31.96	36.64	**41.73**	32.6	27
6 (JC)	92	92	**48.77**	38.37	**43.53**	35.32	38.79	30.96	**42**	39.23	39.81	M	**46.24**	**46.88**	**40.9**	34
7	92	92	**53.33**	33.58	36.10	37.98	35.73	31.52	**46**	35.83	36.76	32.01	**41.95**	**41.72**	38.5	32
8	100	100	**52.76**	38.59	**40.13**	E	39.45	35.95	**48**	**40.71**	40.91	33.72	**40.12**	**49.18**	**41.8**	34
9	92	92	**46.74**	34.64	**41.95**	37.16	32.59	28.02	38	**41.07**	36.46	35.60	**40.10**	38.49	37.6	31
11	100	100	**41.90**	28.07	38.59	31.11	25.48	20.10	29	37.75	27.70	28.03	28.82	39.92	31.4	26
13	100	100	32.53	19.12	27.95	21.45	20.75	17.53	22	20.91	24.37	23.39	26.21	32.84	24.1	20
14 (AC)	100	100	**42.63**	29.52	32.34	29.49	27.67	23.33	32	26.07	30.24	28.24	28.08	39.96	30.8	25
16	100	100	**45.86**	31.51	**47.44**	**39.63**	29.87	30.59	M	38.48	37.89	35.75	M	**41.93**	37.9	31

18	83	83	**73.22**	**58.91**	**65.36**	**59.65**	**60.43**	**60.92**	**81**	**65.00**	**66.27**	**59.57**	**65.97**	**49.69**	**63.8**	**52**
19	100	100	**49.38**	36.18	**49.44**	38.96	37.03	36.95	**50**	**48.45**	**43.16**	**44.18**	**48.43**	**70.82**	**46.1**	38
20	100	100	**65.73**	**40.60**	**53.87**	**42.35**	**42.05**	38.18	M	M	M	**55.39**	**46.33**	**52.40**	**48.5**	**40**
21 (EA)	75	75	**61.08**	**43.61**	**70.12**	**67.52**	**58.40**	**56.29**	**74**	**76.84**	**60.83**	**55.44**	**60.52**	**62.23**	**62.3**	**51**
22	100	100	**67.07**	**53.19**	**48.89**	**46.77**	**53.26**	**56.73**	**54**	**46.16**	**54.69**	**50.30**	**62.42**	**59.01**	**54.4**	**45**
23	100	100	**61.89**	**45.64**	**53.20**	**50.59**	**42.74**	**40.14**	**56**	**59.34**	**54.00**	**43.96**	**53.92**	**52.76**	**51.2**	**42**
24	100	100	**43.46**	31.96	34.46	30.28	28.87	25.16	34	37.19	35.18	34.49	35.35	**40.70**	34.2	28
25	100	100	**41.18**	33.74	39.60	30.81	27.67	26.25	M	30.27	32.13	35.42	36.52	36.42	33.6	28
26	92	92	**52.32**	36.67	41.51	26.27	30.70	27.49	36	34.76	34.32	32.70	M	**41.82**	35.9	29
27	92	92	**48.45**	39.29	38.87	E	**60.65**	30.00	**41**	33.61	33.52	28.29	**41.37**	39.60	39.5	32
28 (BC)	92	92	36.80	30.98	38.90	34.55	27.00	25.51	34	36.68	35.51	33.06	36.76	**41.96**	34.3	28
29 (HA)	100	100	**58.20**	**47.50**	**39.60**	**49.89**	**48.09**	**44.96**	**59**	**55.63**	**53.21**	**42.45**	**47.08**	**55.59**	**50.1**	**41**
30	100	100	**49.48**	36.55	36.73	34.42	32.15	36.08	**47**	38.85	**49.34**	36.53	**46.06**	**44.96**	**40.6**	33
31 (LA)	100	100	28.19	14.15	19.65	15.01	11.81	8.68	14	15.25	14.21	13.32	M	28.14	16.6	14
32	92	92	**43.91**	27.01	33.01	28.33	27.54	21.82	29	23.88	32.37	26.38	31.87	39.51	30.3	25
33	100	100	**52.24**	33.93	44.70	36.32	29.67	33.79	M	27.70	**43.39**	37.24	**45.63**	**47.65**	39.3	32
34 (GC)	92	92	**56.89**	M	**44.18**	38.57	**46.38**	**46.16**	**51**	**41.10**	**50.49**	**42.60**	**58.26**	**52.04**	**47.9**	39
35 (MA)	100	100	39.38	21.97	31.71	23.90	19.71	16.64	24	21.42	27.32	21.22	26.73	34.71	25.7	21

36 (DC)	92	92	**47.16**	31.12	44.18	40.54	32.73	32.53	42	39.94	36.67	31.09	M	42.89	38.3	31
37 (CC)	100	100	**54.00**	43.88	60.71	53.22	39.65	51.78	57	58.15	53.72	41.22	51.69	54.50	51.6	42
38 (EC)	100	100	**47.45**	M	39.40	40.84	38.05	33.01	47	39.23	44.93	34.29	36.84	44.18	40.4	33
39 (FC)	92	92	**45.26**	26.97	37.18	34.03	25.80	25.22	33	30.03	32.36	26.46	29.80	37.23	32.0	26
40	100	100	**48.22**	34.27	39.12	**40.70**	35.50	37.02	**44**	38.32	**44.30**	36.35	**43.95**	**45.66**	**40.6**	33
41	100	100	**51.90**	32.66	37.48	35.71	28.10	29.39	**42**	31.69	**40.89**	27.57	37.36	**43.91**	36.6	30
42	100	100	**53.72**	36.20	**42.48**	**40.75**	37.92	36.99	34	**42.22**	**43.26**	36.91	37.52	**47.28**	**40.8**	33
43	100	100	**50.96**	39.56	**47.58**	**47.29**	39.88	34.56	**49**	**46.47**	**45.87**	37.83	38.38	**48.52**	**43.8**	36
44 (AA)	100	100	**65.62**	56.39	**62.57**	59.79	57.29	M	**76**	**73.22**	**56.00**	**64.81**	**69.86**	**60.01**	**63.8**	**52**
45 (IC)	92	92	**51.90**	M	35.78	39.24	32.82	30.46	**49**	39.25	**45.32**	32.75	36.66	**47.59**	**40.0**	33
46 (HC)	92	92	**59.54**	**43.02**	**48.06**	**41.07**	**42.58**	**40.05**	**50**	**45.40**	**43.13**	**43.23**	**48.66**	**48.60**	**46.1**	38
47	92	92	**52.91**	M	**40.39**	38.92	38.19	38.81	**45**	**46.17**	**46.83**	**47.26**	**53.84**	**51.36**	**45.4**	37
47/2	92	92	**55.40**	M	**42.25**	38.59	38.98	**41.16**	**52**	**44.27**	**42.59**	**48.55**	**49.70**	**51.26**	**45.9**	38
47/3	100	100	**51.76**	**45.72**	**47.31**	37.85	**40.50**	39.16	**50**	**45.44**	**46.44**	**42.40**	**51.20**	**44.56**	**45.2**	37
48	92	92	**48.88**	32.15	33.98	31.57	29.50	28.06	M	33.14	34.68	29.87	32.56	38.65	33.9	28
49	100	100	**44.38**	12.51	38.59	31.57	28.50	24.76	36	33.49	33.26	32.72	36.39	**41.46**	32.8	27
50	83	83	**47.26**	28.21	37.28	32.63	27.80	24.59	**40**	M	38.33	33.61	M	38.39	34.8	29
51	67	67	**46.77**	33.29	32.70	27.14	27.09	M	M	**40.19**	M	M	35.10	39.21	35.2	33

52	92	92	39.48	26.23	30.36	23.05	21.18	20.10	M	25.24	28.04	28.65	30.84	35.52	28.1	23
53	83	83	**58.95**	**49.47**	**48.89**	**39.57**	**48.13**	**46.22**	**54**	M	M	**47.05**	**54.60**	**52.64**	**50.0**	**41**
54	92	92	**49.18**	**43.32**	**62.29**	**63.85**	**50.18**	**51.60**	**66**	M	**59.35**	**41.86**	**54.82**	**55.37**	**54.4**	**45**
55	92	92	61.71	37.98	**40.55**	35.97	**42.57**	**42.44**	**43**	**41.17**	**46.10**	35.42	M	**51.76**	**43.6**	36
56	100	100	39.30	25.27	29.48	21.78	18.32	17.59	24	33.43	23.52	26.09	31.15	37.50	27.3	22
57	100	100	**42.51**	26.49	**38.96**	30.51	19.72	18.34	28	27.36	29.33	13.07	30.50	38.68	28.7	23
S01	100	100	38.16	19.46	28.41	18.28	14.99	12.72	15	17.8	20.84	19.79	22.57	32.12	21.7	18
S4B	92	92	**50.03**	29.86	**42.09**	26.65	23.14	25.96	28	28.97	32.45	M	39.73	**40.87**	33.4	27
S12	83	83	**51.61**	30.05	**48.21**	39.75	M	33.86	38	37.95	**40.48**	36.69	M	**42.41**	39.9	33
S36B	100	100	**53.43**	32.92	**48.13**	39.74	31.67	32.8	38	36.23	40.93	34.41	**40.26**	**48.13**	39.7	33
S51	100	100	**62.12**	36.47	**41.57**	35.3	28.45	30.38	33	34.36	**41.13**	30.92	36.9	**48.28**	38.2	31
S63	100	100	**44.41**	34.59	**43.22**	28.47	32.32	32.83	35	31.77	**42.3**	36.12	**43.02**	**43.87**	37.3	31
S67	100	100	**58.15**	30.24	**49.18**	32.23	31.8	32.24	36	36.38	37.02	**40.93**	**44.31**	**44.61**	39.4	32
S68	100	100	**60.52**	36.06	**60.56**	**46.96**	**38.21**	**42.89**	**49**	**50.87**	**50.12**	**45.95**	**45.22**	**49.3**	**48.0**	39
S69	100	100	**59.56**	33.56	**49.67**	36.41	33.86	30.73	**42**	**40.6**	**41.67**	34.14	35.46	38.41	39.7	33

Notes

Concentrations are presented as µg m^{-3}.

Exceedances of the NO_2 annual mean AQO of 40 µg m^{-3} are shown in **bold**.

NO_2 annual means in excess of 60 µg m^{-3}, indicating a potential exceedance of the NO_2 hourly mean AQS objective are shown in **bold and underlined**.

All means have been "annualised" in accordance with LLAQM Technical Guidance if valid data capture for the calendar year is less than 75% and greater than 25%.

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

(b) data capture for the full calendar year (e.g. if monitoring was carried out for six months the maximum data capture for the full calendar year would be 50%).

M indicates a ‘missing tube’.

E indicates an ‘erroneous’ result that has been removed from the annual mean calculation.

Triplicate diffusion tubes, Site IDs 47, 47/2 and 47/3 are placed with the nitrogen dioxide automatic analyser ME9.

Appendix C Citizen Science Diffusion Tube Monitoring

During 2022 diffusion tubes were supplied by the London Borough of Merton (LBM) to two community groups:

- Wimbledon Park Residents Association (WPRA)
- Sustainable Merton (SM)

While monitoring instructions were provided to a representative of each group the monitoring locations have not been verified by LBM, nor can the correct usage and storage be confirmed. All tubes were prepared and analysed by Gradko Limited, refer to Appendix A for assurance/quality control procedures. Tubes were supplied to a representative of the group on a quarterly basis to WPRA and a monthly basis to SM to allow monitoring to follow the Defra diffusion tube exposure calendar and returned to LBM for collation and onward shipping to Gradko. All analysis reports were sent directly to LBM for checking and the distributed to a representative of each group.

We would like to take the opportunity to thank all groups and the individuals who gave up their time to extend diffusion tube monitoring in the borough.

C.1. Wimbledon Park Residents Association (WPRA)

The WPRA monitor air quality at set locations on a quarterly basis. Monitoring results for 2022 are provided in Table P, data has been annualised and bias adjusted for comparison with the annual mean Air Quality Objective (AQO) of 40 μgm^{-3}. Wimbledon Park 3 was added to Merton Council's diffusion tube monitoring network in January 2022 (Site ID 57) for monthly monitoring, as nitrogen dioxide concentrations were closer to the annual mean AQO at this location in 2021. The data for this location (Site ID 57) is provided in Table D and Table O, the annual mean AQO was achieved in 2022, measured as 23 $\mu g/m^{-3}$. Data for 2019-2022 are provided in Table Q, the annual mean AQO was achieved at all monitoring locations and nitrogen dioxide (NO_2) have continued to decrease annually, with a slight increase observed at Wimbledon Park 6 in 2022 from 2021. A comprehensive list of monitoring locations and descriptions provided by WPRA is presented Table R.

Table P. WPRA NO_2 Annualised and Bias-adjusted Diffusion Tube Results 2022

Site Code	Site Description	Data Capture	January	April	July	October	Annualised annual mean NO_2 concentration (μgm^{-3})	Bias Adjusted Annual Mean NO_2 concentration (μgm^{-3}) (National Factor 0.82)
Wimbledon Park 1	12a Ravensbury Terrace	33%	17.34	11.47	15.30	22.79	19.6	16
Wimbledon Park 2	37 Wellington Road	33%	17.64	11.53	14.56	21.7	19.2	16
Wimbledon Park 4	162 Durnsford Road	33%	22.88	16.03	20.07	31.88	26.6	22
Wimbledon Park 5	141 Arthur Road	33%	22.31	19.55	22.61	29.64	27.6	23
Wimbledon Park 6	44 Home Park Road	33%	17.38	14.24	16.93	28.48	22.5	18

Table Q. WPRA Annual Mean NO_2 Annualised and Bias-adjusted Monitoring Results

Site Code	Site Description	2019	2020 Insufficient data	2021	2022
Wimbledon Park 1	12a Ravensbury Terrace	28		17	16
Wimbledon Park 2	37 Wellington Road	23		18	16
Wimbledon Park 3 (2019-2021) Site ID 57 (2022-)	363 Durnsford Road	**40**		29	23
Wimbledon Park 4	162 Durnsford Road	31		23	22
Wimbledon Park 5	141 Arthur Road	34		24	23
Wimbledon Park 6	44 Home Park Road	26		16	18

Table R. WPRA Monitoring Locations

Site ID	Location	Description	Distance from tube to kerb (m)	Distance to nearest receptor	Height to tube inlet (m)
Wimbledon Park 1	12A Ravensbury Terrace SW18 4RL		At kerb		2m

		On lamppost 009. Between 2 large housing construction sites 1 of 24 dwellings the other 129 dwellings on the old Haslemere Industrial site. Opposite an allotment, nearest current housing 50 metres.			
Wimbledon Park 2	37 Wellington Road SW19 8EQ	 On lamp post 001. Near the junction with Havana Road. Outside WP Primary school in a residential area. Road used by vehicles entering the Wellington Road Industrial Estate.	At kerb		2m
Wimbledon Park 3 (2019-2021) Site ID 57 (2022-)	363 Durnsford Road SW19 8EF	 On lamppost 045. On the main road by a pelican crossing used by children to access the primary school. Housing both sides of the road.	2m		2m

Wimbledon Park 4	Opposite 162 Durnsford Road SW19 8GY	 On lamp post 018. On the junction with Endeavour Way. Entry to an industrial estate used by very large wagons eg Occado, Reston Waste and others. Housing other side of the road.	At kerb		2m
Wimbledon Park 5	141 Arthur Road SW19 8AB	 On the zebra crossing outside Wimbledon Park tube station	At kerb		2m
Wimbledon Park 6	44 Home Park Road SW19 7HN	 Residential area. Road links WP with Wimbledon town centre therefore a lot of through traffic.	At kerb		2m

Figure 3 Map of annual mean NO_2 concentrations 2022 in Wimbledon Park

C.2. Sustainable Merton (SM)

Where sufficient data is available to perform annualisation it has been provided in Table S below, it is not reflective of all monitoring locations covered by SM in 2022. The Citizens Science network is under continual review with the support of Air Quality Officers and a comprehensive list of locations will be provided in the 2024 ASR for 2023.

Table S. SM NO_2 Annualised and Bias-adjusted Diffusion Tube Results 2022

Site ID	Valid data capture 2022 %	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Annualised annual mean NO_2 concentration (μgm^{-3})	Bias Adjusted Annual Mean NO_2 concentration (μgm^{-3}) (National Factor 0.82)
SC1 Marlborough Road /High Street	67	**55.54**		**52.83**				**48.90**	**47.26**	**51.47**	**59.30**	**53.18**	**54.47**	**40.1**	33
SC2 South Gardens/Singlegate School	75	35.91	19.79	**49.36**				15.86	18.04	21.34	20.11	23.53	29.38	20.3	17

SC14 Christchurch Road/Burger King	75	**58.96**	**44.69**	28.35				**50.68**	**50.44**	**46.91**	**41.95**	**45.64**	**45.78**	36.0	30
SC15 Worple Rd	50		**41.69**						**50.98**	**48.64**	**51.67**	**46.01**	**46.00**	36.7	33

Notes

Concentrations are presented as µg m^{-3}.

Exceedances of the NO_2 annual mean AQO of 40 µg m^{-3} are shown in **bold**.

NO_2 annual means in excess of 60 µg m^{-3}, indicating a potential exceedance of the NO_2 hourly mean AQS objective are shown in **bold and underlined**.

All means have been "annualised" in accordance with LLAQM Technical Guidance if valid data capture for the calendar year is less than 75% and greater than 25%.

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

(b) data capture for the full calendar year (e.g. if monitoring was carried out for six months the maximum data capture for the full calendar year would be 50%).

Appendix D Breathe London Monitoring Report 2022

This file is provided as a supplementary document to the ASR.