London Borough of Richmond upon Thames
Air Quality Annual Status Report for 2022

Date of publication: 26th May 2023

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

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

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Executive Summary

The London Borough of Richmond upon Thames is committed to improving air quality in the Borough. The Council is demonstrating its political leadership; taking action; leading by example; monitoring air quality; using the planning system; integrating air quality into the public health system; and informing the public. This 2023 Annual Status Report reviews recent air quality monitoring in the Borough in accordance with Defra LAQM guidance. In doing so, it fulfils one further aspect of this ongoing commitment.

The report identifies that:

For carbon monoxide, benzene, 1,3-butadiene, lead and sulphur dioxide there is not a significant risk of the objectives being exceeded in the Council's area.

In December 2000, the Council designated an Air Quality Management Area (AQMA) across the whole Borough for nitrogen dioxide and particles (specifically PM_{10}). The findings from this report indicate that the AQMA should be maintained.

In view of the findings from the report, the Council will undertake the following actions:

1. Undertake consultation with the statutory and other consultees as required.
2. Maintain the existing monitoring programme.
3. Update and implement its Air Quality Action Plan in pursuit of the AQS objectives.
4. Prepare for the submission of its next Air Quality report.

Tables

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

Air Quality Objectives

The air quality objectives applicable to LAQM in England are set out in the Air Quality (England) Regulations 2000 (SI 928), The Air Quality (England) (Amendment) Regulations 2002 (SI 3043), and are shown in Table A. This table shows the objectives in units of micrograms per cubic metre µg m^{-3} (milligrams per cubic metre, mg m^{-3} for carbon monoxide) with the number of exceedences in each year that are permitted (where applicable).

Table A. Summary of National Air Quality Standards and Objectives

Pollutant	**Standard/Objective (UK)**	**Averaging Period**	**Date[1]**
Nitrogen dioxide - NO_2	200 □g m^{-3} not to be exceeded more than 18 times a year	1-hour mean	31 Dec 2005
	40 □g m^{-3}	Annual mean	31 Dec 2005
Particles - PM_{10}	50 □g m^{-3} not to be exceeded more than 35 times a year	24-hour mean	31 Dec 2004
	40 □g m^{-3}	Annual mean	31 Dec 2004
Particles - $PM_{2.5}$	20 □g m^{-3}	Annual mean	2020
	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
	350 µg m^{-3} not to be exceeded more than 24 times a year	1 hour mean	31 Dec 2004
	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

1. Air Quality Monitoring

The latest monitoring results for 2022 confirm that air pollution in the London Borough of Richmond upon Thames still exceeds the Government Air Quality objectives in some locations, and therefore there is still a need for LBRuT to be designated as an AQMA and to pursue improvements in air quality. LBRUT also recognise the possibility of stricter objectives following changes to the World Health Organisation Guidelines on 22nd September 2021.

The Council (and NPL for $PM_{2.5}$) routinely monitor the pollutants below:

- NO_2
- PM_{10}
- Ozone (O_3)
- $PM_{2.5}$

The Council previously monitored SO_2 (ceased in April 2011), CO (ceased in April 2012), and Benzene (ceased in January 2012) which are not included in this report. Please see previous Council reports for further information. The LBRuT have complied with UK/EU limit values for these pollutants for a minimum of 3 years prior to cessation of monitoring.

1.1 Locations

Automatic Monitoring Sites

Our continuous monitors collect real time data, which are stored as 15-minute ‘means’ and can then be converted into the various averages. This type of equipment provides accurate measurements of pollution levels but is expensive, so using them for a large coverage of LBRuT is cost prohibitive.

The sites (see Table B) are also representative of relevant exposure either at the site or very close by. The two Richmond operated sites are part of the Imperial College London Air Quality Network, as is the site at the National Physical Laboratory (NPL). This site is also part of the government's UK Automatic Urban and Rural Network (AURN). Richmond also had a mobile Air Quality monitoring unit, which was stationed at Chertsey Road, TW2. Unfortunately, it was stolen during the summer of 2020. Richmond Council will replace the air quality station in 2023 through section 106 funding and include the monitoring of PM2.5. It is anticipated that the location of this site will be Richmond Town Centre.

All data undergoes quality assurance and quality control (QA/QC) procedures to ensure that the data obtained is of a high quality. The standards of QA/QC at the LAQN sites are similar to those of the government's AURN sites. For QA/QC purposes, all the continuous analysers are manually checked and calibrated every two weeks, serviced every six months and audited by an independent auditor (the National Physical Laboratory) every six months. Subsequent data ratification is undertaken by Imperial College London. Further details of the sites can be found at www.londonair.org.uk.

Table B. Details of Automatic Monitoring Sites for 2022

Site ID	Site Name	X (m)	Y (m)	Site Type	In AQMA?	Distance from monitoring site to relevant exposure	Distance to kerb of nearest road (N/A if not applicable)	Inlet height	Pollutants monitored	Monitoring technique
RI1	**Castelnau Library**, Barnes	522500	177166	Roadside	Y	8m	3m	2.35m	NO2, PM10	Chemiluminescent; TEOM
RI2	**Wetlands Centre**, Barnes	522993	176731	Suburban	Y	Children in adjacent play area/people attending	N/A	3.2m	NO2, PM10,O3	Chemiluminescent; TEOM

						Wetlands Centre				
TD0	**NPL -** Teddington AURN	515542	170420	Suburban	Y	N/A	N/A	N/A	PM10, PM2.5 and O3	Chemiluminescent; FDMS

Non-Automatic Monitoring Sites

Table C lists the details of the NO2 diffusion tube monitoring locations in the LBRuT. The tubes are a relatively cheap and accurate method of monitoring, which allows samples to be taken across the whole LBRuT and gives a Borough-wide view. The results are provided as monthly averages and so provide an indication of NO2 pollution levels. The accuracy of the diffusion tube readings can be increased when their results are compared, and then bias adjusted, with data from the more accurate continuous monitors. The Council had a network of 64 permanent diffusion tube sites across the Borough in 2022. Two of the diffusion tubes sites are triplicate and co-located with both Council automatic monitoring sites. All sites are kept under constant review and a few will be amended or moved at the beginning of each year, often in response to requests for more area specific monitoring.

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

Site ID	Site Name	X (m)	Y (m)	Site Type	In AQMA ?	Distance of tube to kerbside	Distance of receptor to kerbside	Inlet height (approx.)	Pollutants monitored	Tube co-located with an automatic monitor.
						(m)	(m)	(m)		(Y/N)
1	Hampton Court Rd, Hampton	515824	168815	roadside	Y	1.7m	1.9m	2.2m	NO2	N
2	Percy Rd, Hampton (nr. Level crossing/ Waitrose)	513217	169746	roadside	Y	1.3m	3.0m	2.2m	NO2	N
4	Hampton Rd, Hampton Hill (nr. Laurel Dene)	514607	171258	kerbside	Y	0.6m	9.8m	2.2m	NO2	N
7	Broad St, Teddington (Boots)	515695	170983	kerbside	Y	0.8m	2.5m	2.2m	NO2	N
9	Hampton Rd, Twickenham	514846	172348	kerbside	Y	0.6m	2.0m	2.2m	NO2	N
10	Twickenham Rd, Twickenham (opp. Fulwell golf course)	513390	172233	kerbside	Y	0.6m	7.2m	2.2m	NO2	N

11	Percy Rd, Whitton (nr. Percy Way)	514136	173389	kerbside	Y	0.6m	9.1m	2.2m	NO2	N
12	Hanworth Rd, Whitton	512612	173439	kerbside	Y	0.6m	7.4m	2.2m	NO2	N
13	Whitton Rd, Whitton, (opp. rugby ground)	515228	174082	kerbside	Y	0.8m	6.3m	2.2m	NO2	N
15	Richmond Rd, Twickenham (opp. Marble Hill Park)	517196	173933	kerbside	Y	0.6m	1.7m	2.2m	NO2	N
17	Red Lion Street, Richmond	517822	174755	roadside	Y	1.2m	2.0m	2.2m	NO2	N
18	Lower Mortlake Rd, Richmond (nr. Trinity Rd)	518822	175590	kerbside	Y	0.9m	9.3m	2.2m	NO2	N
19	Kew Rd, Kew (nr. Walpole Av)	518643	176156	kerbside	Y	0.7m	16m	2.2m	NO2	N
20	Mortlake Rd, Kew (nr. Kent Rd)	519205	177221	kerbside	Y	0.6m	2.8	2.2m	NO2	N
22	Castelnau, Barnes (nr. Hammersmith Bridge)	522853	177908	kerbside	Y	0.5m	4.2m	2.2m	NO2	N

23	Castelnau Library, Barnes (static site)	522502	177166	roadside	Y	3.3m	9m	2.2m	NO2	Y
25	URRW, (nr. East Sheen Prim Sch)	521199	175460	roadside	Y	2.3m	2.5m	2.2m	NO2	N
26	URRW, Sheen (nr. Courtland Estate)	519168	175055	roadside	Y	3.2m	11.8	2.2m	NO2	N
27	Queens Rd, Richmond (nr. St Elizabeth's RC Prim Sch)	518847	174513	roadside	Y	1.9m	6.8m	2.2m	NO2	N
28	Holly Lodge, Richmond Pk	519445	173991	urban backgro und	Y	2175m	N/A	2.2m	NO2	N
30	Petersham Rd nr The Russell Schl,	518022	173165	roadside	Y	2.8m	1.3m	2.2m	NO2	N
31	A316 (nr. Chudleigh Rd)	515434	174045	roadside	Y	1.0m	6.4m	2.2m	NO2	N
32	Kings St, Twickenham	516226	173195	roadside	Y	1.0m	3.2m (2.8m paveme nt café)	2.2m	NO2	N

33	Heath Rd, Twickenham	516098	173153	roadside	Y	3.3m	6.9m	2.2m	NO2	N
35	High St, Hampton Wick	517524	169583	roadside	Y	1.3m	1.4m	2.2m	NO2	N
36	Upper Richmond Road West (URRW) nr Sheen Lane	520540	175399	roadside	Y	2.1m	2.2m	2.2m	NO2	N
37	Wetlands, Barnes (static site)	522993	176731	urban backgro und	Y	1160m	230m	2.2m	NO2	Y
39	Richmond Rd, nr. Lidl/Deer Park School, E Twick.	517516	174331	roadside	Y	1.0m	1.7m	2.2m	NO2	N
40	Staines Rd, Twickenham	514068	172435	roadside	Y	1.0m	11.4m	2.2m	NO2	N
41	Paradise Rd, Richmond	518164	174872	kerbside	Y	0.9m	5.6m	2.2m	NO2	N
42	The Quadrant/Kew Rd, Richmond	518080	175259	roadside	Y	0.7m	2.9m	2.2m	NO2	N
43	Hill St, Richmond	517759	174757	kerbside	Y	0.7m	1.6m	2.2m	NO2	N

44	Sheen Rd, Richmond (near shops)	518489	175056	kerbside	Y	0.5m	2.5m	2.2m	NO2	N
45	154 High St, Teddington,	516383	171154	kerbside	Y	0.5m	3.3m	2.2m	NO2	N
50	URRW, nr. Clifford Av, Sheen	519922	175324	kerbside	Y	0.7	2.7	2.2m	NO2	N
51	Sheen Lane, SW14 (nr Thomson Hse Sch & railway crossing)	520490	175695	roadside	Y	2.0m	2.1m	2.2m	NO2	N
52	Clifford Av, nr Chalkers Corner	519773	175795	roadside	Y	2.0m	2.1	2.2m	NO2	N
53	co-located on mobile Air Quality unit, A316 nr RUTC	513360	173995	roadside	Y	varies	varies	2.2m	NO2	Y
54	Mortlake Road, adjacent to West Hall Road, Kew	519585	176492	kerbside	Y	0.6	1.3	2.2m	NO2	N
55	Mortlake Road, adjacent to Cemetery Gates,	519793	176142	kerbside	Y	0.6	4.1	2.2m	NO2	N

56	A316 (nr St Margaret's roundabout)	516788	174519	roadside	Y	1.0m	9.6m	2.2m	NO2	N
57	A316 (nr Lincoln Avenue)	513915	172899	roadside	Y	1.0m	16.4m	2.2m	NO2	N
58	London Road, Twickenham	516039	173766	kerbside	Y	0.7m	6.4m	2.2m	NO2	N
62	High Street, Barnes	521651	176430	kerbside	Y	0.4m	2.3m	2.2m	NO2	N
63	High Street, Whitton	514188	173801	roadside	Y	1.8m	3.2m	2.2m	NO2	N
64	High Street, Hampton Hill	514484	171251	kerbside	Y	0.5m	1.6m	2.2m	NO2	N
65	York Street, Twickenham	516339	173366	kerbside	Y	0.5m	2.7m	2.2m	NO2	N
66	South Circular, Kew Green	519060	177428	roadside	Y	2.1m	3.3m	2.2m	NO2	N
67	Petersham Rd opp Poppy Factory,	518042	174095	roadside	Y	1.4m	2.7m	2.2m	NO2	N

68	Rocks Lane, Barnes	522415	176537	roadside	Y	3.2m	3.8m	2.2m	NO2	N
69	Uxbridge Rd nr Longford Cl, TW12	513494	171729	roadside	Y	2.0m	8.1m	2.2m	NO2	N
70	Stag Brewery, Lower Richmond Rd, SW14	520465	175965	roadside	Y	1.8m	2.1m	2.2m	NO2	N
71	A316, St Stephens Primary School	516574	174456	roadside	Y	2.9m	9.9m	2.2m	NO2	N
72	St Margarets Rd, nr St Margaret's station, TW1	516839	174238	kerbside	Y	0.8m	2.5m	2.2m	NO2	N
73	Hospital Bridge Rd, nr Homelink	513722	172873	roadside	Y	2.1m	8.4m	5.0m	NO2	N
74	Lower Richmond Rd (nr A316)	519856	175856	roadside	Y	2.6m	5.9m	2.2m	NO2	N
75	Hampton Rd (opp Tedd Mem Hosp)	515459	171029	kerbside	Y	0.6m	6.3m	2.2m	NO2	N
76	Manor Rd, nr Ferry Rd, TW11	516588	171357	kerbside	Y	0.4m	3.3m	2.2m	NO2	N

77	Sixth Cross Rd, nr Wellington Rd,TW2	514705	172092	roadside	Y	0.6m	4.5m	2.3m	NO2	N
79	South St, outside Lidl, TW2	514810	172041	roadside	Y	1.0m	6.6m	2.2m	NO2	N
80	Mortlake High St, nr Post Office	520538	175926	kerbside	Y	0.8m	2.6m	2.4m	NO2	N
81	Chertsey Ct (A316)	519912	175939	roadside	Y	1.7m	14.6m	2.5m	NO2	N
82 (61)	London Road, Twickenham (near Twick'hm station development)	516060	173708	roadside	Y	2.5m	4.8m	2.6m	NO2	N
83(78)	Thames Street, A308, Hampton, TW12	513811	169510	kerbside	Y	0.3	0.9m	2.5m	NO2	N
Rut 01	Civic Centre, York St, Twickenham	516415	173419	roadside	Y	2.9m	3.0m	5.0m	NO2	N
Rut 02	George Street, Richmond	517917	174928	kerbside	Y	0.7m	2.2m	2.2m	NO2	N

1.2 Comparison of Monitoring Results with AQOs

The results presented are after adjustments for “annualisation” and for distance to a location of relevant public exposure (if required), the details of which are described in Appendix A. For results that indicate the exposure estimate, calculated for the nearest residential façade see Table N.

Table D. Annual Mean NO_2 Ratified and Bias-adjusted Monitoring Results (⍰g m-3)

Site ID	Site type	Valid data capture for monitoring period %[a]	Valid data capture 2022 %[b]	Annual Mean Concentration (µgm^{-3})						
				2016	2017	2018	2019	2020	2021	2022
Castelnau Library, Barnes (RI1)	Automatic Roadside	100%	80%	36	31	31	27	20	21	23
Wetlands Centre, Barnes (RI2)	Automatic Suburban	100%	62%	25	21	20	21	15	14	14
NPL - Teddington AURN (TD0)	Automatic Suburban	N/A	N/A	22	N/A	N/A	N/A	N/A	N/A	N/A

1	Diffusion tube (D/T) Roadside	100	100	**56**	**55**	**41**	35	25	26	22
2	D/T Roadside	100	100	31	29	32	29	21	24	21
3	D/T Roadside	100	Closed	**42**	39	closed	closed	closed	closed	closed
4	D/T Kerbside	100	92	**40**	36	35	31	27	28	24
6	closed	100	closed	37	30	34	closed	closed	closed	closed
7	D/T Kerbside	100	92	**49**	**43**	**45**	39	34	37	26
9	D/T Kerbside	100	100	**45**	**40**	**40**	**35**	31	31	23
10	D/T Kerbside	100	100	**44**	**42**	**41**	**40**	33	33	26
11	D/T Kerbside	100	100	**48**	**47**	**46**	34	27	27	24
12	D/T Kerbside	100	92	**45**	**41**	**44**	**40**	31	30	26
13	D/T Kerbside	100	92	**42**	**42**	**40**	**39**	36	30	24
14	D/T Kerbside	closed	closed	**40**	36	36	33	closed	closed	closed

15	D/T Kerbside	100	100	**41**	38	34	32	26	26	21
16	D/T Roadside	closed	closed	**42**	38	37	closed	closed	closed	closed
17	D/T Roadside	100	92	**69**	**60**	**54**	**50**	**40**	**46**	31
18	D/T Kerbside	100	92	**56**	**58**	**46**	**46**	**41**	39	30
19	D/T Kerbside	100	100	**49**	**49**	**42**	**37**	**30**	28	21
20	D/T Kerbside	100	100	**47**	**45**	38	38	30	28	32
21 (74)	D/T Roadside	closed	closed	39	36	closed	closed	closed	closed	closed
22	D/T Kerbside	100	100	**65**	**52**	**45**	32	21	22	17
23	D/T Roadside	100	100	35	35	31	26	20	21	17
24	D/T Kerbside	closed	closed	37	34	31	28	closed	closed	closed
25	D/T Roadside	100	92	**45**	**46**	38	36	34	34	29
26	D/T Roadside	100	100	**40**	**40**	36	34	32	33	28
27	D/T Roadside	100	100	**43**	**41**	37	32	21	23	18

28	D/T Urban background	100	100	21	17	18	17	12	12	11
29	D/T Roadside	closed	closed	32	30	31	28	21	20	closed
30	D/T Roadside	100	100	33	closed	closed	closed	closed	25	20
31	D/T Roadside	100	100	**54**	**52**	**49**	**45**	35	35	31
32	D/T Roadside	100	92	**64**	**59**	**56**	**47**	**40**	**40**	31
33	D/T Roadside	100	92	**61**	**53**	**52**	**40**	34	39	28
34	D/T Roadside	closed	closed	36	35	32	30	closed	closed	closed
35	D/T Roadside	100	100	**46**	**45**	**42**	36	32	30	25
36	D/T Roadside	100	100	**50**	**60**	**63**	**61**	**56**	**55**	**52**
37	D/T Urban background	100	100	25	20	21	20	14	14	14
39	D/T Roadside	100	67	**55**	**52**	**45**	39	32	32	30
40	D/T Roadside	100	92	**45**	**42**	**41**	35	29	29	24
41	D/T Kerbside	closed	closed	39	36	34	32	closed	closed	closed

42	D/T Roadside	100	92	**82**	**89**	**72**	**62**	**60**	**54**	**41**
43	D/T Kerbside	100	83	**85**	**78**	**59**	**46**	**41**	**43**	39
44	D/T Kerbside	100	92	**42**	**41**	**40**	37	33	32	29
45	D/T Kerbside	100	92	37	35	33	32	26	26	20
47	D/T Roadside	closed	closed	33	31	29	closed	closed	closed	closed
48	D/T Roadside	closed	closed	**41**	**40**	**40**	33	closed	closed	closed
49	D/T Kerbside	closed	closed	**44**	31	closed	Closed	closed	closed	closed
50	D/T Kerbside	100	100	**55**	**53**	**52**	**50**	**45**	**46**	39
51	D/T Roadside	100	100	32	35	33	30	24	23	19
52	D/T Roadside	100	100	**57**	**50**	**59**	**55**	**46**	**45**	39
53	D/T varies	closed	closed	N/A	**44**	**43**	**41**	34	closed	closed
54	D/T Kerbside	100	100	**49**	**48**	**40**	**40**	32	30	26
55	D/T Kerbside	100	100	**50**	**45**	**41**	**40**	33	29	26

56	D/T Roadside	100	100	**51**	**50**	**43**	39	31	29	23
57	D/T Roadside	100	92	**44**	**42**	**43**	37	29	29	23
58	D/T Kerbside	100	100	**50**	**47**	**43**	**40**	33	31	25
59	D/T Kerbside	closed	closed	**44**	39	**40**	34	27	closed	closed
60	D/T Kerbside	closed	closed	29	29	29	closed	closed	closed	closed
61	D/T Roadside	closed	closed	**49**	**45**	**43**	38	32	31	closed
62	D/T Kerbside	100	100	**51**	**50**	**43**	**43**	32	32	25
63	D/T Roadside	100	92	**41**	38	38	33	27	27	26
64	D/T Kerbside	100	100	**53**	**49**	**45**	**41**	34	35	30
65	D/T Kerbside	100	92	**75**	**68**	**55**	**50**	**40**	**40**	33
66	D/T Roadside	100	100	**49**	**49**	**42**	**40**	32	30	27
67	D/T Roadside	100	92	Not open	**44**	**41**	32	23	23	21
68	D/T Roadside	100	100	Not open	Not open	**55**	**40**	31	30	25

69	D/T Roadside	100	92	Not open	Not open	38	31	22	23	20
70	D/T Roadside	100	75	Not open	Not open	Not open	**42**	33	34	27
71	D/T Roadside	100	100	Not open	Not open	Not open	**52**	**43**	39	34
72	D/T Kerbside	100	100	Not open	Not open	Not open	**42**	33	30	26
73	D/T Roadside	100	92	Not open	Not open	Not open	**43**	36	34	28
74 (21)	D/T Roadside	100	100	Not open	Not open	**50**	**52**	**43**	**44**	32
75	D/T Kerbside	100	92	Not open	Not open	Not open	Not open	29	29	25
76	D/T Kerbside	100	100	Not open	Not open	Not open	Not open	35	35	30
77	D/T Kerbside	100	100	Not open	Not open	Not open	Not open	38	37	31
78/34(83)	D/T Roadside	closed	closed	36	35	32	30	25	24	closed
79	D/T Kerbside	100	100	Not open	Not open	Not open	Not open	33	32	25
80	D/T Kerbside	100	100	Not open	Not open	Not open	Not open	Not open	30	24
81	D/T Roadside	100	100	Not open	Not open	Not open	Not open	Not open	30	32

82	D/T Roadside	100	92	Not open	Not open	Not open	Not open	Not open	Not open	21
83(78)	D/T Kerbside	100	100	Not open	Not open	Not open	Not open	Not open	Not open	30
Rut 01	D/T Roadside	100	100	**50**	**51**	38	36	29	27	24
Rut 02	D/T Kerbside	100	92	**88**	**96**	**82**	**72**	**63**	**52**	**43**

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 **orange and 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 **red, bold and underlined**. In 2022 no site exceeded 60ug/m3 after bias correction.

Means for diffusion tubes have been corrected for bias. The bias adjustment factor used for all sites is 0.82 calculated using the national Gradko bias adjustment figure for 50%TEA/ACETONE.

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 33%. **This applied to The Wetlands Centre automatic analyser and site 39 in 2022**.

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%).

Maximum data capture for the monitoring period, for all diffusion tube sites was a full 12 months – 100%. Missing tubes resulted in slightly reduced data capture at individual sites.

The bias adjustment factor used for **all roadside/kerbside** sites is **0.82** calculated using **the National bias adjustment factor for 50% TEA/acetone** for Gradko. The bias adjustment factor for **background sites** 28 and 37 is also **0.82** calculated using **the National bias adjustment factor for 50% TEA/acetone** for Gradko. Data capture at Wetlands (RI2) was 62%, and at Castelnau (RI1) was 80% below the 90% required by DEFRA. For this reason the National bias adjustment factor for Gradko was used to bias adjust all air quality sites in Richmond borough. For more information, see Appendix A.2.

Notes on sites:

From 5/1/22 site 29 was closed and site 81 was made permanent (opened 5/1/21); site 63 moved slightly up Whitton High St on request - site name/number retained; site 61 moved > 20m nearer new Twickenham station development, renamed site 82; site 78(34) moved along A308 >20m on request renamed site 83.

From 5/1/21 site 59 was closed, site 80 was opened. From Aug 2020 air quality mobile was stolen, some data recoverable for 2020, no data for 2021 onwards.

From 6/1/20 sites 14, 24, 41 were closed; sites 75, 76, 77 opened; sites 2, 4, 27 and 29 moved slightly (<20m) to better represent worst-case scenario following requests from residents/officer observation. Site 34 and 48 moved > 20m so for clarity have been renamed site 78 and 79 respectively. Aug 2020 the air quality mobile was stolen – data ceased.

From 9/1/19 sites 6, 16, 47 and 60 were closed; sites 70, 71, 72 and 73 were opened.

From 2/1/18 sites 3 and 49 were closed; sites 68 and 69 opened; site 21 was moved approx. 200m in response to resident's requests/officer observation and is now close to the junction at Chalkers Corner, so for clarity has been renamed site 74. Site 36 and 51 were moved slightly (<20m); See Table C for correct grid references for 2018 onwards and 2017 ASR for earlier grid references.

From 3/1/17 sites 25, 36, 49, 51, 56 were moved slightly (<20m) largely in response to residents requests for marginally better monitoring locations. All grid references are correct for 2017 monitoring onwards. Please see our 2016 Annual Status Report for earlier coordinates.

From 6/1/16 site 57 was moved nearer the road, no longer behind a small section of green screening to better represent most of this section of the A316.

Automatic Monitoring Site data

Table D provides the 2022 results of the NO_2 automatic monitoring and a comparison with the annual mean objective.

The 2022 NO_2 data capture rate for RI1 Castelnau was 80% and for RI2 Wetlands 62%. Since data capture fell below 75% at Wetlands data has been annualised using the mean of 4 x local background sites. This calculated out at 14.2ug.m3 annualised mean. Details are in Appendix A.2. Data capture rate was regrettably lower than usual, partly due to problems with equipment failure. Defra require a 90% data capture rate to be fully representative of the full year, so results for both Castelnau and Wetlands should be used for guidance only.

The 2022 results indicate that both sites met the objective of 40 $\mu g\ m^{-3}$. The 2022 annual mean for the RI2 (Wetlands) was 14 $\mu g\ m^{-3}$ both as a raw and annualised mean unchanged from 2021. This site is a background site and therefore representative of low pollution in the Borough. The annual mean at the RI1 (Castelnau) roadside site was 23 $\mu g\ m^{-3}$ a slight increase from 21$\mu g\ m^{-3}$ in 2021. It should be noted that Castelnau, although a roadside site, is not currently representative of typical roadside concentrations for LBRUT. This is because Hammersmith Bridge at the end of Castelnau was closed to all vehicles on 10th April 2019 for safety reasons until strengthening work is completed. This is likely to take at least 5 years. Data from 2019 reflects this indicating more significant reductions than may otherwise be monitored.

Furthermore from Saturday 28 May 2016 -2020, in order to preserve the lifespan of Hammersmith Bridge, it was necessary to limit the number of buses using the structure. HGV's were also limited – the bridge had a weight restriction of 7.5 tonnes preventing many HGV's from crossing and therefore reducing their number past the Air Quality cabin at the library. This means there has been a large reduction in the number of vehicles along Castelnau from 2016-2022 and a corresponding reduction in levels of NO2 at this roadside site. Consideration has been given to relocating the site. On balance, following discussions with the Council and Imperial College London, for data continuity and trend data purposes, it has been decided to leave it in situ. This will be reviewed annually.

A new roadside static automatic monitoring site is planned for Richmond town centre, once funding is available.

Diffusion Tube Monitoring Data

Table D shows the NO2 diffusion tube monitoring results, with bias corrected values for each year from 2016 to 2022. (Note – see Table O for monthly data for 2022 and Table N for the distance corrected).

The data capture for 2022 for all diffusion tube sites was very good (95.96%). Just one site recorded a data capture of less than 75%, site 39 in East Twickenham, near Deer Park School and Lidl. Unfortunately, diffusion tubes were missing for 4 months for no apparent reason at this site. It is hard to know why this happens and whether or not it is deliberate. The data has been annualised to improve accuracy.

The results in **bold** and **orange** indicate an exceedance of the annual mean objective of 40 μg m-3 and the results in **bold red** and **underlined** indicate NO2 annual means in excess of 60 μg m-3 indicating a potential exceedance of the NO2 hourly mean AQS objective. The results show reductions at all sites borough wide for 2022 with the exception of site 20 on Mortlake Rd, which has increased. This could be partly due to displacement traffic to avoid the expanded ULEZ (effective for roads inside the south circular in Kew, Mortlake, East Sheen and Barnes from 25th October 2021). For the second year in the last 20 years of monitoring in the

borough, after bias adjustment, no site has exceeded 60ug/m3, which is very encouraging. However, site 36 on Upper Richmond Rd West near Sheen Lane in East Sheen, before bias adjustment, measured 63 μg m^{-3} in 2022, 63 μg m^{-3} in 2021 and 62 μg m^{-3} in 2020 and is proving a challenge to reduce. Bias adjustment has reduced it to 52μg m^{-3} in 2022, 55μg m^{-3} in 2021 and 56μg m^{-3} in 2020 but this still needs further improvements. If the proposed ULEZ expansion to outer London materialises, this is likely to speed up reductions in the area and at this site. Site 20, on Mortlake Rd is the only site which has witnessed an increase this year up from 28μg m^{-3} in 2021 to 32 μg m^{-3} in 2022 for bias adjusted annual NO2. Both these sites are on the South Circular – the border for the north/south circular ULEZ (effective from 25 October 2021) and thus currently excluded from ULEZ emission standards. ULEZ does not directly affect about 2/3rds of the borough in the centre, east and south. In 2022 sites have improved significantly across the entire borough, both inside and outside the proposed ULEZ expansion area. We know from contacts and enquiries that some residents with non-compliant vehicles no longer travel inside the ULEZ. We know some have upgraded vehicles to comply and some have ceased using non-compliant vehicles. Both help reduce emissions inside the zone and upgrades outside the zone. We know that any vehicle that regularly travels into the ULEZ zone is likely to upgrade rather than pay daily fines of £12.50, which will have knock on effects for the surrounding area. In a recent report, the Mayor of London claims that pollution levels are 21 per cent lower than they would have been without the ULEZ in inner London, which is welcome news. The overall borough picture is generally a very positive downward trend in air pollution with improvements, sometimes significant improvements of 10 μg m^{-3} or more in town centres such as Richmond, Twickenham and Teddington, which is excellent news. This is a less mixed picture than in 2021 and it is fairly safe to say that the feared return of higher levels of pollution post COVID-19 does not appear to have materialised.

The total number of sites where monitoring was undertaken was 64; two of these were triplicates, co-located next to real time automatic analysers. Two sites were background the remainder – 62 - were roadside or kerbside.

The Council has carried out considerable extra monitoring in 2022 linked to proposed road changes – an LTN in Hampton Hill and East Sheen, the introduction of the extended ULEZ next to East Sheen Primary School in East Sheen, and in and around

Richmond and Bushy Parks to monitor parks and displacement traffic from parks in response to the proposed Movement Strategy by Royal Parks. These are not permanent sites and it was decided not to include monitoring results in this report. Data for these areas is available on the Council's website here.

In 2022, the Council also commenced a 3-year programme from Jan 2022 – Dec 2024 to monitor worst-case scenario for a full year outside all state schools in the borough. These results have been included. Please see Appendix C at the end of the report for results for schools monitored in 2022. These are also available on the Council website here. More data will be available in future ASR's.

The results from the 2022 monitoring show that the Defra objective of 40 μg m-3 was exceeded at just 3 sites (4.7%) and complied at 61 sites (95.3%). For comparison, in 2021, there were 63 sites - 10 that exceeded (15.9%) and 53 sites (84.1%) that complied. These headline figures are very encouraging, even more so when data is analysed more closely. You see that in 2021 35 (55.6%) sites recorded the same or slightly higher levels of NO2 in 2021 when compared to 2020; 28 (44.4%) recorded lower levels, albeit that many of these stayed within the Defra parameters - above or below the objective of 40 μg m-3. By comparison in 2022, almost every site - 63 out of 64 sites (98.4%) - measured reductions, some significant reductions. None stayed the same and only one increased. Richmond town centre is particularly noteworthy - site 42, opposite the station in Richmond saw reductions of 13μg m^{-3} down from 54μg m^{-3} to 41μg m^{-3} and site 17 on Paradise Rd in Richmond saw reductions of 15μg m^{-3} down from 46μg m^{-3} to 31μg m^{-3} ; site 33 in Twickenham town centre saw reductions of 11μg m^{-3} from 39μg m^{-3} down to 28μg m^{-3} site 7 outside Boots in Teddington town centre saw reductions of 11μg m^{-3} down from 37μg m^{-3} to 26μg $m^{-3.}$ Site 74 near Chalkers Corner also saw reductions of 12μg m^{-3} down from 44μg m^{-3} to 32μg m^{-3}. These are the largest reductions for at least the last 7 years and are truly significant. Historically Richmond town centre has recorded some of the highest exceedences borough wide for over 20 years, so this reduction is very good news. Environmental Health wanted to compare traffic flows against air quality data for 2022 to see whether the volume and/or fleet mix had changed post lockdown but this has proved difficult due to the lack of available relevant

comparative traffic data. It does appear that post dieselgate the introduction of real driving emission standards has had a noticeable effect on fleet upgrades. Vehicles driving on the road are cleaner and this is at last having an impact on reduced emissions borough wide.

As already stated, only one site exceeded 60ug/m3 before bias adjustment in 2022 – site 36 - Upper Richmond Road West, East Sheen. This recorded 63$\mu g\ m^{-3}$ raw data, down to 52$\mu g\ m^{-3}$ after bias adjustment, which has changed little in each of the last three years – 2020 - 2022. This remains significantly above the annual bias adjustment level of 40ug/m3, accepted as harmful to health, so more work is needed.

Site 36 is on the South Circular. Congestion along this section of the South Circular remains high, partly supplemented by diverted traffic from the closure of Hammersmith Bridge for major repairs. There is no simple solution; closure is likely to remain in place for at least 5 years. To a certain extent, this section also suffers from the closure of East Sheen Gate in Richmond Park, diverting traffic onto the South Circular. Pressure for major development nearby at the Stag Brewery site and Barnes hospital may further exacerbate matters without careful traffic considerations.

Richmond town centre – site 42 – near the taxi rank and opposite Richmond station, the main public transport hub in LBRUT, has seen some of the most significant reductions in 2022. This could be partly due to a gradually upgrading taxi fleet to zero emission at tailpipe – mainly electric and partly due to a lack of engine idling. A lot of work has been done throughout 2022 and the two preceding years with continued awareness raising, campaigns, anti-idling signage and regular warnings by LBRUT traffic wardens. The rising cost of fuel in 2021/22 may also have contributed. Most taxis now switch off. Acknowledgement must also go to TfL. 16 bus routes serve Richmond station so work done by TfL to clean up the bus fleet was both very important and welcome. By Feb 2021 all TfL buses, serving LBRUT were either Euro VI compliant, hybrid or retrofitted. This helped reduce NOx emissions from the TfL bus fleet by up to 95%. This will have made a difference to 2022 levels in all town centres, including Richmond, Twickenham and Teddington

and will continue so to do for years to come. Further upgrades are planned. We wish to credit TfL for this work – it has helped significantly.

2022 has probably witnessed the beginning of the new “norm” for work travel. For occupations that have allowed , COVID has changed the way many people want to work and the acceptance and encouragement of this by most employers. It is likely to remain so, certainly for the near future. Part working from home/part working from the office has now become commonplace. Change in working practice is likely to some extent to effect traffic and with it, air quality. It was feared that gains made to air quality during lockdown would be lost once life returned to normal. There is no evidence of this. Whilst improvements for 2021 were somewhat mixed, the picture for 2022 appears to be improving and a return to pre COVID-19 – to 2019 values – appears unlikely. This is significant since 2019 witnessed the most significant percentage decrease in measured annual NO2 in the last 20 years. In 2016 48 x monitoring sites (out of 64) (75%) exceeded the annual bias adjusted level of 40ug/m3, in 2019 27 x sites (42%) exceeded and in 2022 just 3 x sites (5%). These are significant reductions and confirms the downward trend in air pollution, which is very encouraging.

Significantly, after distance correction for nearest façade, the annual mean objective in 2022 was exceeded at just 2 sites, down from 5 in 2021 and 24 in 2019. None, after bias adjustment, exceeded the annual mean concentration of 60 μg m-3 in 2022, which is excellent news.

Trend graphs on p39, 40 and p41 below, clearly demonstrate this general trend, which, despite a few fluctuations remains downward.

Many factors at all levels of central and local government contributed to this. 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. Many are switching to electric or hybrid. 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 contributed. 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.

LBRUT Council assessments for emission-based parking are resulting in new thought-provoking enquiries, which may influence residents when replacing vehicles. Its encouragement of the healthy streets strategy, the introduction of 14 new school streets and encouragement for modal shift away from the private car on to bikes, cargo bikes, walking and public transport will also help. 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 beyond target borough wide. Lastly, idling is a political priority for LBRUT. Throughout 2022, the pollution team has promoted training, erected signage, run campaigns, and responded to all complaints on engine idling. LBRUT's traffic wardens have warned drivers on a daily basis not to idle. In 2022, they issued 11,425 warnings to drivers and in the last 4 years have issued over 42,500 warnings, which is one of the highest across London and probably within the UK. This is having a noticeable impact on driver awareness and behaviour change for engine idling.

The LEZ, which requires the use of Euro 4 or better for diesel passenger cars, diesel delivery vans, campervans and motorhomes and Euro 6 for diesel trucks, buses and coaches., applicable 24/7, 365 days a year, along the A316, the borough road with the highest daily traffic count, appears to have resulted in benefits indicated by reductions in trend data at site 71, 57, 56, 31 and 18 for 2022. In 2022 none of these sites along the A316 exceeded the annual bias adjusted value of 40ug/m3.

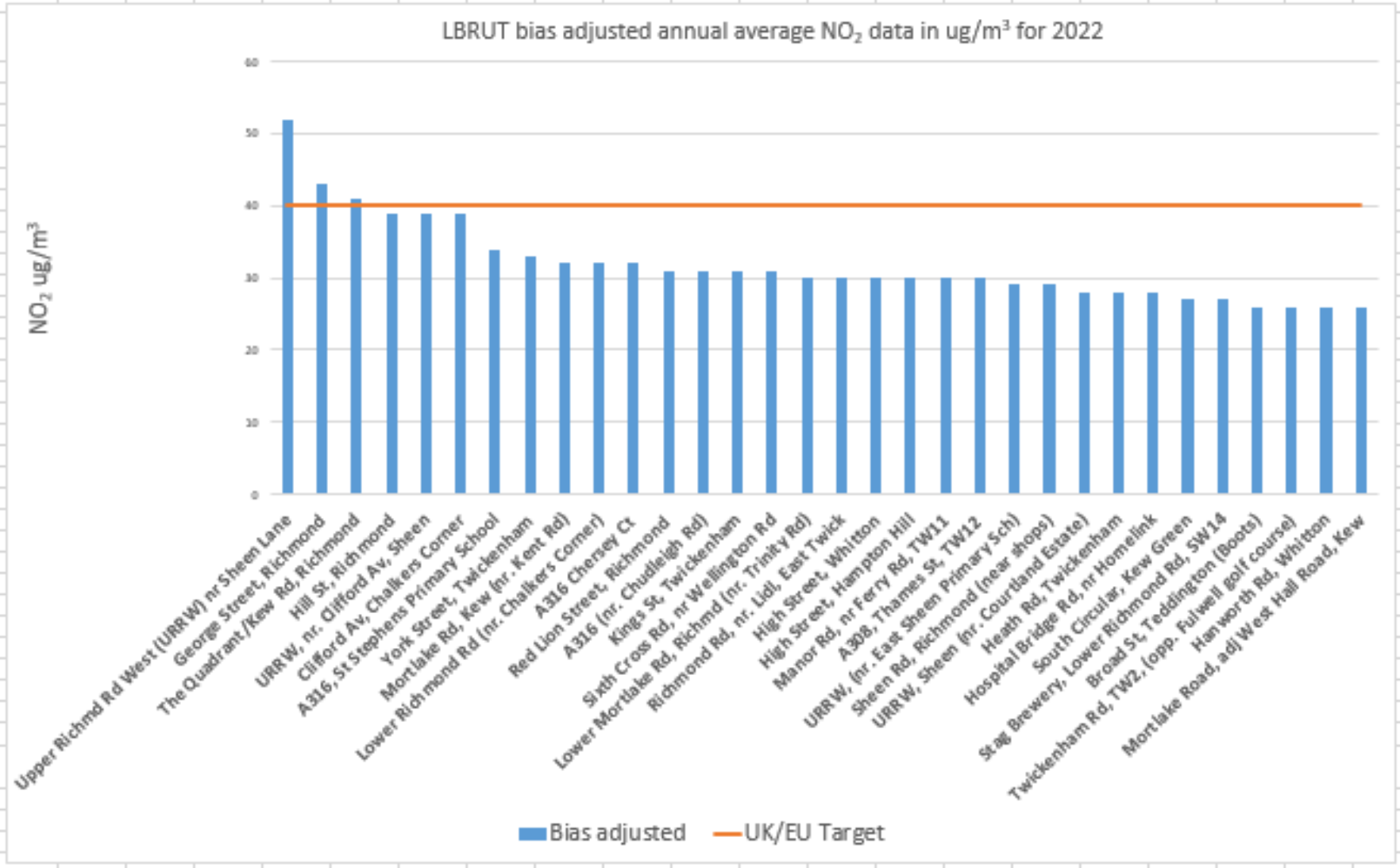
The overall monitoring results for the Borough in 2022 are positive and show compliance borough wide with the exception of 3 sites in two town centres, Richmond and East Sheen, where NO2 concentrations still exceeded the UK annual mean objective (as it has done for each year since 2002). This is in line with the modelling prediction for the Borough. However, air quality data does fluctuate

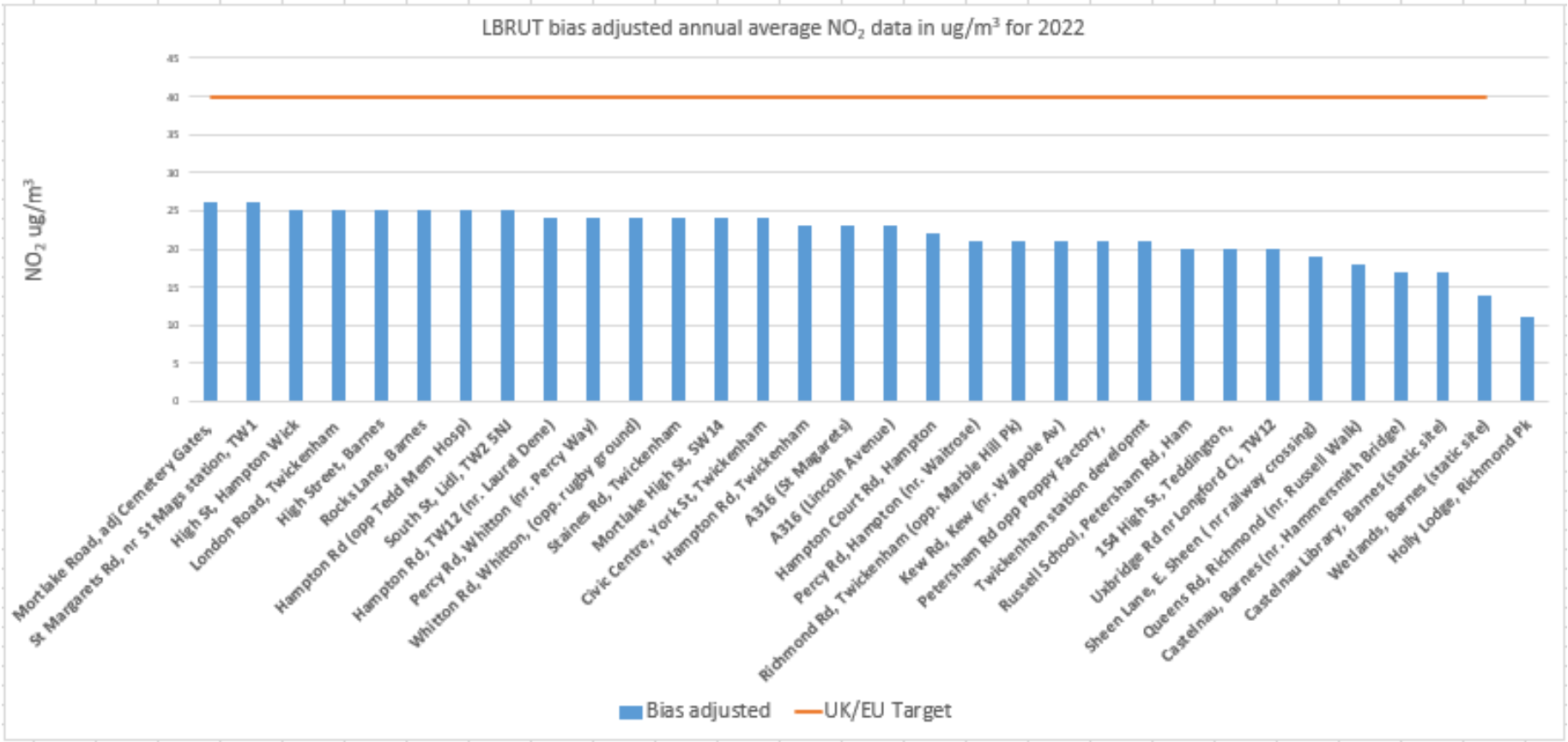
slightly year on year. We are however optimistic that it will remain on a downward trajectory. Reductions beyond UK limit values are welcome, since the more we know and understand about harm to health associated with air pollution, the more we want to aim for achieving the more stringent voluntary WHO levels set out in September 2021. This will require a step change in the way we live our lives, travel and heat our homes. It will be interesting to see when full compliance with UK limit values across the entire borough can be achieved. We will continue to strive to achieve this as soon as possible.

Below are charts, graphs and a map to help visualise the results.

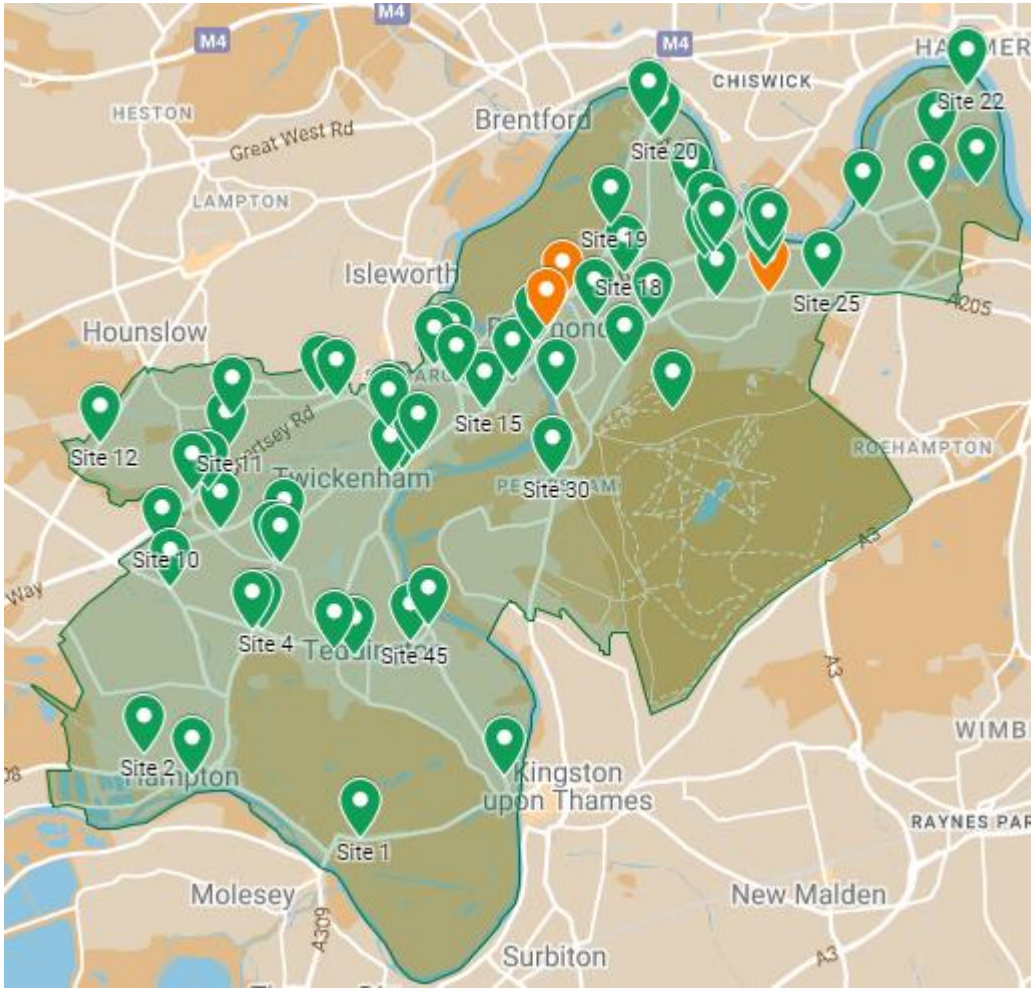
This year we have again included bar charts of data for all sites ranked in order of exceedance and a map showing locations – indicating good coverage for the whole borough (NB LBRUT has 2x large areas of Royal Parks – Richmond and Bushy Park).We have also increased the number of sites to 15, included in our trend charts, covering town centres, main roads, a level crossing and a background site from 2002 – 2022 to give more perspective to levels of NO2 over a long time period. We hope this is enlightening.

Figure 1: Nitrogen Dioxide Bias Adjusted Annual Average Concentrations for all sites for 2022 (split over 2 graphs)




LBRUT bias adjusted annual average NO2 data in ug/m3 for 2022
NO2 ug/m3
45
40
35
30
25
20
15
10
5
0
Mortlake Road, adj Cemetery Gates
St Margarets Rd, nr St Mags station, TW1
High St, Hampton Wick
London Road, Twickenham
High Street, Barnes
Rocks Lane, Barnes
Hampton Rd (opp Tedd Mem Hosp)
South St, Lidl, TW2 5NJ
Hampton Rd, TW12 (nr. Laurel Dene)
Percy Rd, Whitton (nr. Percy Way)
Whitton Rd, Whitton, (opp. rugby ground)
Staines Rd, Twickenham
Mortlake High St, SW14
Civic Centre, York St, Twickenham
Hampton Rd, Twickenham
A316 (St Margarets)
A316 (Lincoln Avenue)
Hampton Court Rd, Hampton
Percy Rd, Hampton (nr. Waitrose)
Richmond Rd, Twickenham (opp. Marble Hill Pk)
Kew Rd, Kew (nr. Walpole Av)
Petersham Rd opp Poppy Factory,
Twickenham station developmt
Russell School, Petersham Rd, Ham
154 High St, Teddington,
Uxbridge Rd nr Longford Cl, TW12
Sheen Lane, E. Sheen (nr railway crossing)
Queens Rd, Richmond (nr. Russell Walk)
Castelnau, Barnes (nr. Hammersmith Bridge)
Castelnau Library, Barnes (static site)
Wetlands, Barnes (static site)
Holly Lodge, Richmond Pk
Bias adjusted
UK/EU Target

Map of NO2 diffusion tube sites in LBRUT in 2022



All results are annual bias adjusted

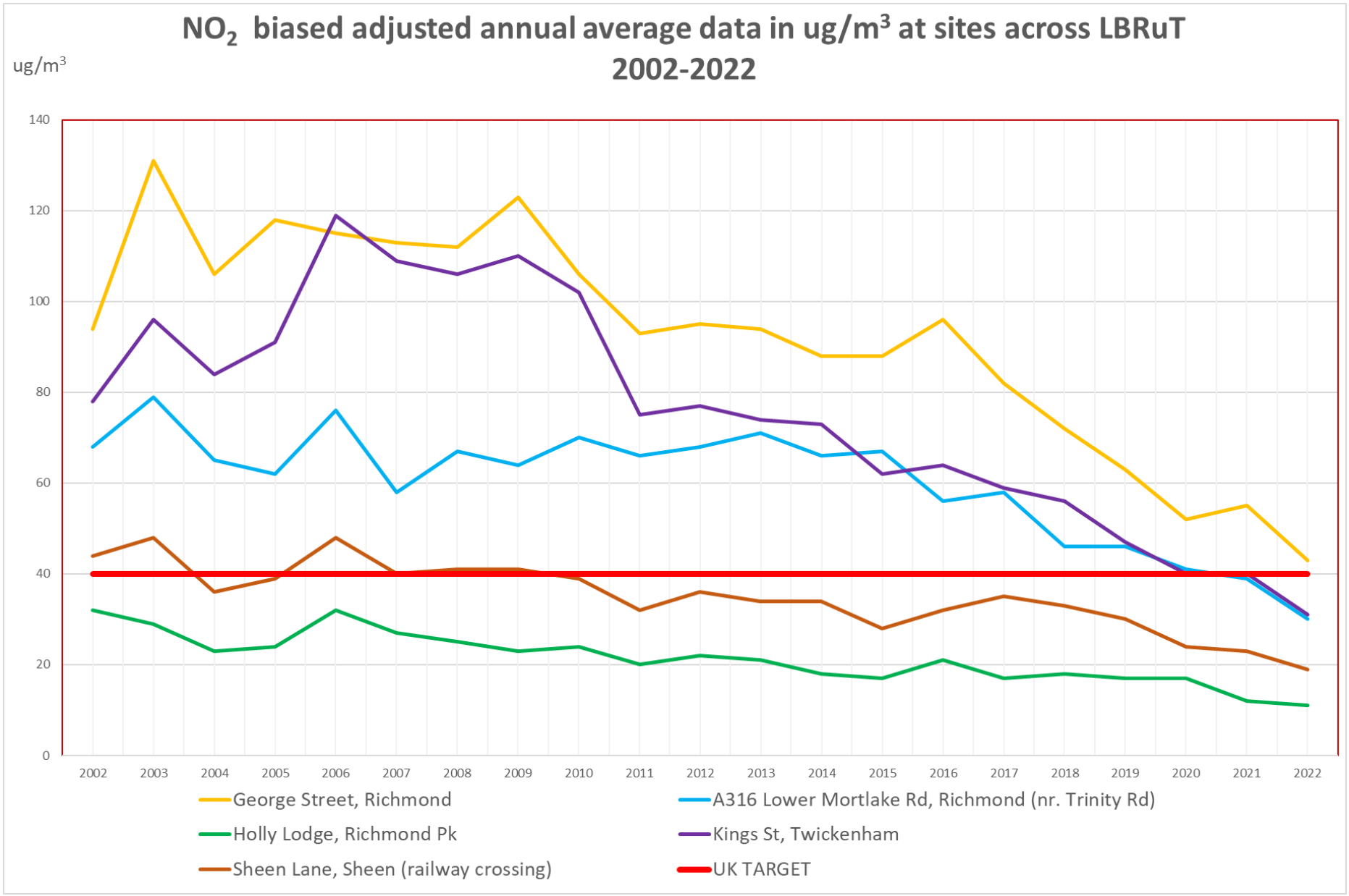
Key:

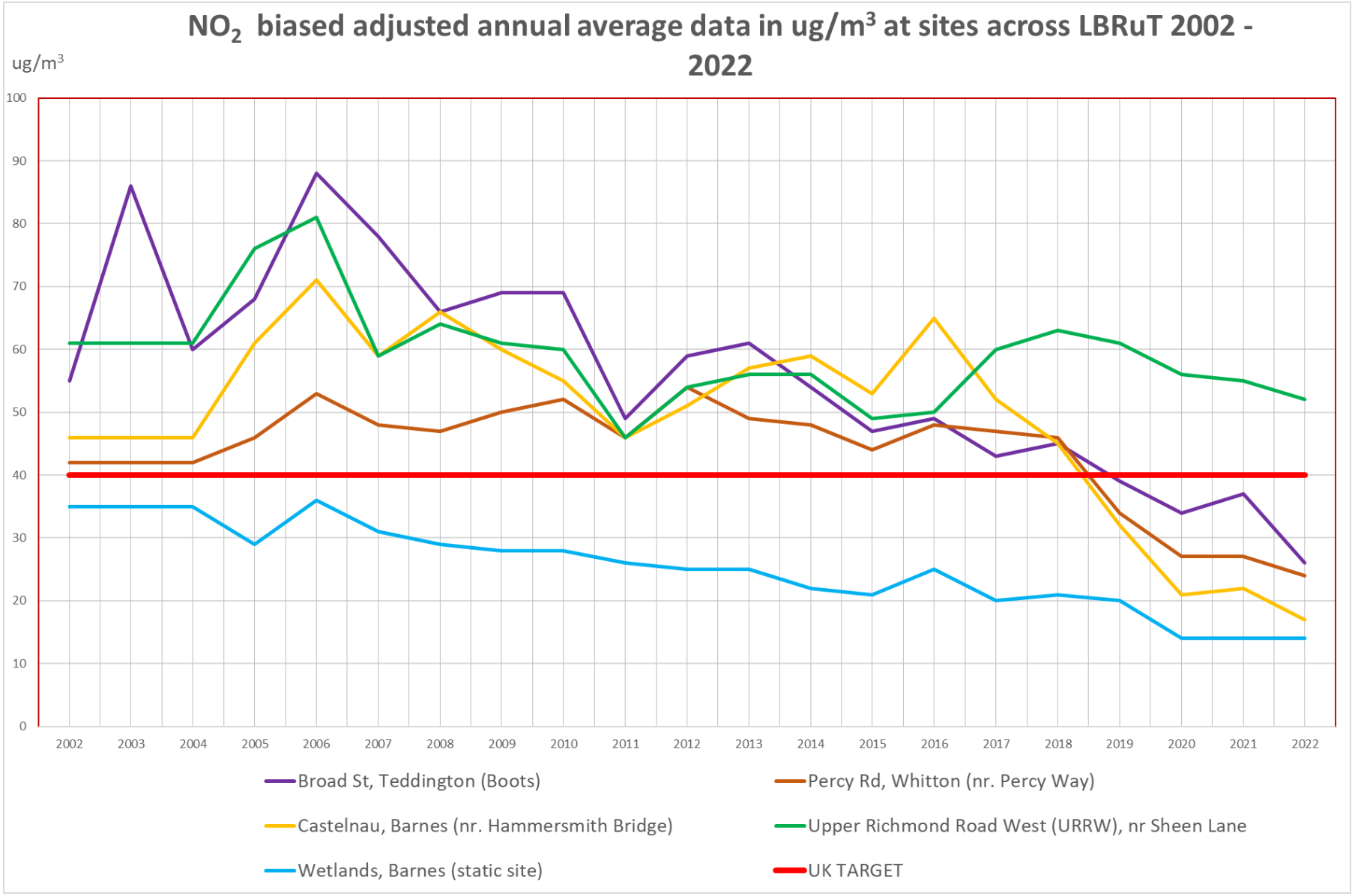
0-39 µg/m³ (complies with EU/UK annual NO2 limit value)

40-59 µg/m³ (exceeds EU/UK annual NO2 limit value)

60 µg/m³ and over (exceeds EU/UK annual NO2, likely exceeds EU/UK hourly NO2 limit value)

https://www.google.com/maps/d/viewer?mid=1FXi3kxJxhB-OJOYKU1JqQp-IiTHfcCH5&ll=51.43908395006437%2C-0.33272889246094506&z=12


NO_2 biased adjusted annual average data in ug/m³ at sites across LBRuT 2002-2022
ug/m³
140
120
100
80
60
40
20
0
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
George Street, Richmond
A316 Lower Mortlake Rd, Richmond (nr. Trinity Rd)
Holly Lodge, Richmond Pk
Kings St, Twickenham
Sheen Lane, Sheen (railway crossing)
UK TARGET


NO_2 biased adjusted annual average data in ug/m^3 at sites across LBRuT 2002 - 2022
ug/m^3
100
90
80
70
60
50
40
30
20
10
0
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
Broad St, Teddington (Boots)
Percy Rd, Whitton (nr. Percy Way)
Castelnau, Barnes (nr. Hammersmith Bridge)
Upper Richmond Road West (URRW), nr Sheen Lane
Wetlands, Barnes (static site)
UK TARGET

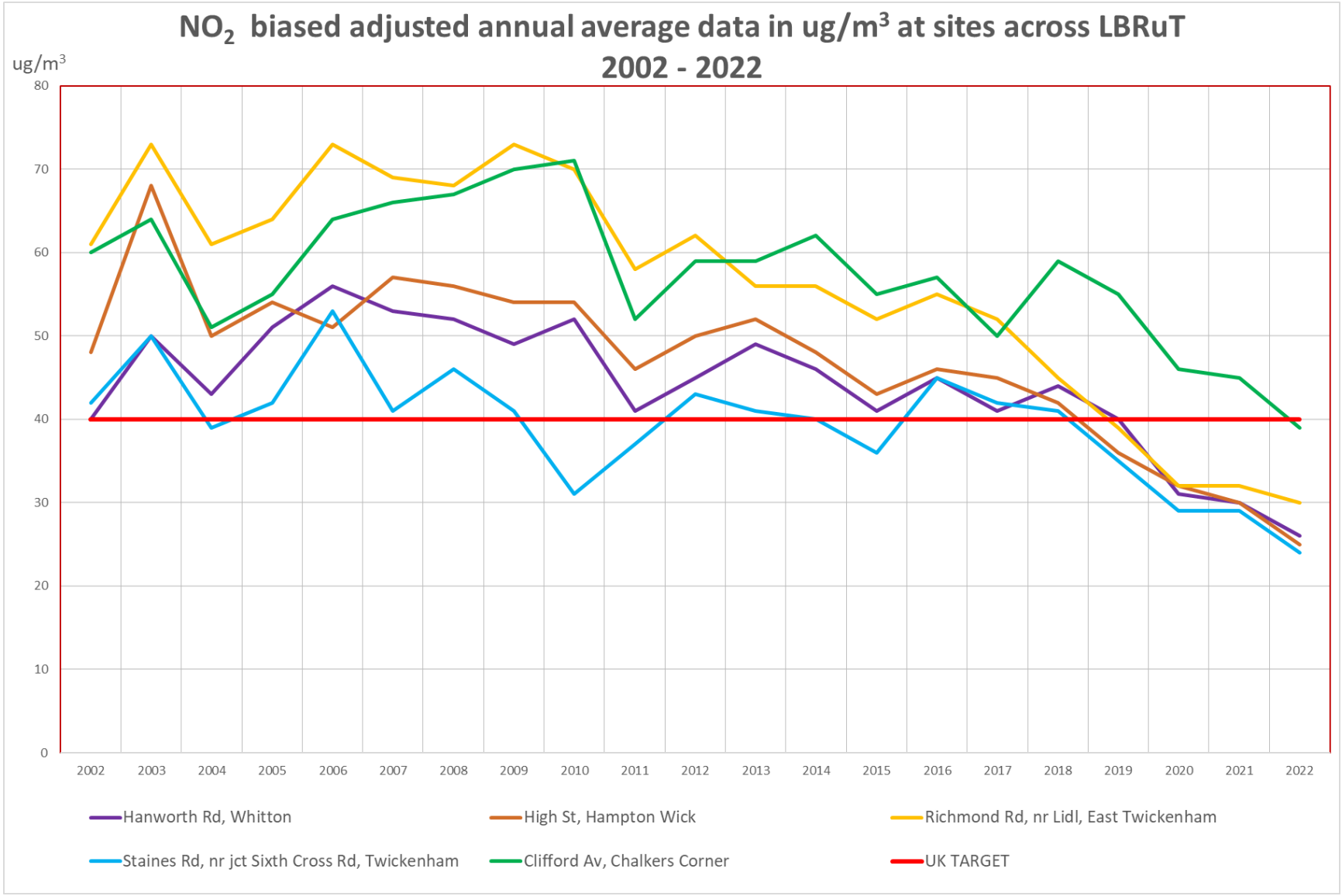

NO_2 biased adjusted annual average data in ug/m³ at sites across LBRuT
2002 - 2022
ug/m³
80
70
60
50
40
30
20
10
0
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
Hanworth Rd, Whitton
High St, Hampton Wick
Richmond Rd, nr Lidl, East Twickenham
Staines Rd, nr jct Sixth Cross Rd, Twickenham
Clifford Av, Chalkers Corner
UK TARGET

Table E. NO_2 Automatic Monitor Results: Comparison with 1-hour Mean Objective

Site ID	Valid data capture for monitoring period %([b])	Valid data capture 2022 %([b])	Number of Hourly Means > 200 µgm^{-3}						
			2016	2017	2018	2019	2020	2021	2022
Castelnau Library, Barnes (RI1)	100	80	0	0	0	0	0	0	0 (0)
Wetlands Centre, Barnes (RI2)	100	62	0	0	0	0	0	0	0 (0)

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%)

Warning: **Castlenau and Barnes Wetlands - Nitrogen Dioxide achieved a capture rate less than 90% for the year (80% and 62% respectively). Results may not be representative of the full year and should be used for guidance only.**

Table E provides the results of automatic monitoring for NO2 for the 1-hour mean objective of 200 μg m-3. It was met at all sites and for every year reported. This is encouraging news. The data for 2022 is fully ratified.

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

Site ID	Valid data capture for monitoring period % [b]	Valid data capture 2022 % [b]	Annual Mean Concentration (μgm^{-3})						
			2016	2017	2018	2019	2020	2021	2022
Castelnau Library, Barnes (RI1)	100	90	20	18	19	15	15	16	15
Wetlands Centre, Barnes (RI2)	100	98	16	15	15	16	16	15	14
NPL - Teddington AURN	100	97	N/A	N/A	N/A	N/A	13	12	14

Notes

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

Exceedance 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%. It was not necessary to annualise any PM data for 2022.

(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%).

All data for PM10 at Castelnau and Wetlands is fully ratified. Dates for ratification are unknown at NPL.

The LBRuT uses a Tapered Element Oscillating Microbalance (TEOM) to continuously monitor PM_{10}. All TEOM results are converted to reference equivalence using the Volatile Correction Method (VCM), which is administered by Imperial College London, when they process our monitoring data. As mentioned in section 1, PM_{10} is a specified pollutant for the whole Borough AQMA.

Table F provides results of automatic monitoring of PM10 and a comparison with the annual mean objective. The objective of 40 μg m-3 was met at all sites for every year reported. All data is fully ratified.

The 2022 annual mean for PM10 at both the roadside site in Castelnau Barnes decreased slightly from 16ug/m3 to 15ug/m3 2021 to 2022 and at the background site at the Wetlands Centre in Barnes decreased slightly from 15ug/m3 to 14ug/m3 2021 to 2022. Wetlands has recorded 15ug/m3 or 16ug/m3 every year for the last 6 years from 2016 – 2021, this is the first year is decreased slightly further to 14ug/m3. This is only slight; it may increase again slightly in 2023. This illustrates how challenging it is to reduce levels of PM. As has been pointed out under the NO2 section, Castelnau has seen significantly less traffic in 2019 – 2022 due to the closure of Hammersmith Bridge, at the end of Castelnau, to all traffic from 10th April 2019. The bridge is undergoing major repairs and is likely to remain closed for a number of years.

The PM10 monitoring results for the LBRuT automatic sites are compared directly to the annual mean and 24 hour mean objectives. Tables F and G provide results for the period from 2016 to 2022 inclusive. PM10 measurement was undertaken at three sites and the data capture was very good at all sites - R12 Wetlands achieving 98%, RI1 Castelnau achieving 90% and TDO, Bushy Park, Teddington NPL achieving 97%. As advised, PM10 data at Castelnau and Wetlands is fully ratified and dates for ratification at TDO NPL are unknown.

PM10 is proving very difficult to reduce further. Over the 7-year period from 2016 – 2022 it has fluctuated slightly one year to the next and a slight downward trend overall has been achieved. This is encouraging. However, it has gone up as well as down fractionally year on year, so we cannot get complacent. Around half of UK concentrations of PM comes from anthropogenic sources in the UK such as wood burning, and tyre and brake wear from vehicles. This is particularly relevant for Richmond, where wood burning fires have increased in popularity. Specific efforts are being made to reduce PM's from burning, (see Table J 2.3). It is particularly significant to note no decline at either site in 2020, despite reduced traffic due to COVID-19.

It should be noted that whilst all three sites meet the UK/EU limit value (40 μg m-3) they struggle to meet the new, stricter WHO guidelines (15 μg m-3) for PM10. In 2022, Wetlands measured 14ug/m3, just below this threshold. It was anticipated that Defra may reduce limit values in 2022 but this has not happened. Modelling indicates there are some exceedences of the UK/EU limit value (40 μg m-3) for PM10 on some sections of major roads within the borough, including near Richmond on the A316, so vigilance is required. We hope to install a new automatic monitoring station in Richmond town centre, which will monitor both PM10 and PM2.5, as soon as funding is available. We will reassess this in next years' report.

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)]	Number of Daily Means > 50 µgm^{-3}						
			2016	2017	2018	2019	2020	2021	2022
Castelnau Library, Barnes (RI1)	100	90	7	4	1	3	0	0	1
Wetlands Centre, Barnes (RI2)	100	98	3	3	0	3	0	0	1
NPL - Teddington AURN	100	97	N/A	N/A	N/A	N/A	2	0	1

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%).

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Table G provides the comparison with the 24-hour mean objective for PM10. The objective of no more than 35 days exceeding 50 µg m-3 was met at each site for all years reported. In 2022, 1 exceedence was recorded at all 3 sites. The number of days exceeding

the daily standard remains relatively low at all sites for the last 7 years. Again, levels are going up and down year on year so vigilance is required.

The concentrations measured in Richmond are considered typical of those measured elsewhere across London (KCL, 2012).

Elevated PM10 levels can result from episodes, which are often the result of local combined with imported transboundary conditions from elsewhere in the UK and Europe.

Table H. Annual Mean $PM_{2.5}$ Automatic Monitoring Results (µg m^{-3})

Site ID	Valid data capture for monitoring period %[a]	Valid data capture 2022 %[b]	Annual Mean Concentration (µgm^{-3})						
			2016	2017	2018	2019	2020	2021	2022
NPL Bushy Park, Teddington (TD5)	100	98	N/A	10	11	12	8	8	9

Notes:

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

Exceedances of the $PM_{2.5}$ annual mean AQO of 20 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%).

Warning: The data for 2022 is provisional data and has not been fully ratified so should be treated with caution.

Table H provides results of automatic monitoring of PM2.5 by NPL in Bushy Park and a comparison with the annual mean objective.

Annual mean for 2022 is 9ug/m3, a slight increase of 1ug/m3 from 2021. The objective of 20 μg m-3 was met for every year reported.

This does reinforce results of compliance for particulate matter in the London Borough of Richmond upon Thames. The Council, together with many other local authorities in London, does not currently have an automatic PM2.5 monitor.

2. Action to Improve Air Quality

2.1 Air Quality Action Plan Progress

The Council approved an updated AQAP for 2020 – 2025 on 10th March 2020. The new AQAP has involved direct consultation and engagement with community groups. The result is a more robust, more transparent, more accountable AQAP, which is public facing. Improving air quality in the borough is a top political commitment. The new AQAP reflects changes in air quality policy, creating an environment that is welcoming to sustainable transport and aimed at the pedestrian and/or cyclist, identifying specific bold and brave measures to tackle pollution in local 'hot-spots' within the borough and prioritising schools.

The updated AQAP 2020 – 2025 is supported by the departmental Heads of Service for Environmental Health, Transport and Planning, Public Health, the Director of Public Health, the Director of Environment and Cabinet members.

Table J provides a brief summary of the London Borough of Richmond upon Thames' progress against the new 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	LLAQM Action Matrix Theme	Action	Progress • Emissions/Concentration data • Benefits • Negative impacts / Complaints
1.1	Monitoring and other core statutory duties	Maintain our monitoring regime in the borough	LBRUT believes monitoring is the backbone of air quality, essential to identifying and understanding problem areas, vital to inform solutions and interventions. Throughout 2022, LBRUT maintained 2 x automatic stations monitoring NO2, PM10 and O3 and 64 x permanent NO2 diffusion tube sites borough wide. LBRuT is looking to replace the stolen mobile air quality station with a static site in Richmond town centre as soon as funding is available.

			LBRUT is part of the LAQN and values the work done by Imperial College to help achieve and maintain the highest possible standards. Bias adjusted annual results in ASR's are published asap online
1.2	Monitoring and other core statutory duties	Present quarterly updates through the air quality action plan in simple to use format and ensure complete transparency	Results are continually updated and made publicly available. Latest raw data is available quarterly online here The AQAP is updated regularly and meetings held with community groups to ensure transparency and to listen to ideas and concerns. Data is regularly provided for concerned residents and Cllrs on request.
1.3	Monitoring and other core statutory duties	Continuous review and improvement of the Air Quality Network throughout the borough	Sites are reviewed and updated annually. Review is carried out in December each year; new sites commence in January to enable full 12 month data sets. The Council listens to concerns from residents. Suggestions from community groups and individuals are received throughout the year and included where possible, sometimes for short term monitoring, sometimes for permanent sites.
1.4	Monitoring and other core statutory duties	Positively encourage and support citizen science activities where these actively contribute to identifying and tackling air pollution in the borough. Including the provision of Diffusion Tubes and hand held monitoring	Target: to support 4 projects including up to 150 additional diffusion tubes for locations borough wide. The Council exceeded its target; it installed in excess of 630 x additional NO2 diffusion tubes for 4 separate projects plus ad hoc hot spot monitoring in 2022. In 2022, all 4 projects were around proposed road schemes – 2 proposed LTN's, one in East Sheen and one in Hampton Hill, East Sheen Primary School on the South Circular, next to the extended ULEZ, and traffic that would be effected by the Royal Parks Movement strategy - displacement and through traffic in Richmond and Bushy Parks. Hampton Hill proved highly contentious and residents were keen to see data. Data was provided to help inform decision-making. Trials have been extended and monitoring continued in 2023 in order to assess traffic and pollution levels as the new "normal" working patterns emerge. Work with East Sheen Primary School has continued to help measure any effects of the extended ULEZ, which started operating from 25th October 2021 outside its gates. This was in response to concerns from parents and the head teacher. The Council also installed 45 x new low cost sensors as part of the Breathe London Internet of Things project, in High streets and near schools, some co-located with Vivacity traffic sensors, some with NO2 diffusion tubes. These were run and installed by LBRUT, mainly in response to concerns from residents, parents and Cllrs. All results are available on the Breathe London website: https://www.breathelondon.org/

			Data is available on the Council website here Breathe London low cost sensors were used borough wide to give residents and Cllrs a sense of real time data showing expected diurnal peaks and troughs. This project has proved popular and so has been extended into 2023.
1.5	Monitoring and other core statutory duties	All schools in areas of poor air quality to be incorporated into our monitoring network and regime	We had already monitored schools in areas of poorer air quality and from modelling, no other schools were likely to exceed annual limit values of 40ug/m3 for NO2.but due to growing concerns, we decided all schools should be monitored. Results for schools monitored in 2022 are in Appendix C LBRUT continued to monitor certain schools as part of its permanent air quality monitoring programme. This included St Stephens School on the A316 and East Sheen Primary on the South Circular. These 2 schools are sited near higher polluting roads in the borough, so we are keen to keep a close eye on monitoring results. Both schools were part of the Mayors air quality audits in 2018 and received funding to mitigate exposure. Both were compliant in the playground where children play and inside classrooms. Ad hoc air quality monitoring is offered to all schools and is regularly provided to help address concerns.
1.6	Monitoring and other core statutory duties	Roll out monitoring to all schools in the borough to provide information	Target: 12 monitoring sites per annum in Primary Schools. In 2021, following various requests, it was decided to increase this target – both the duration and the number of schools. Therefore, from 1/1/22 LBRuT commenced a 3-year programme to monitor 24/7 for a full year worst-case scenario outside all state schools within the borough. In 2022, the Council monitored at 15 Primary Schools for 12 months, for more robust data. This is in addition to those monitored as part of the permanent monitoring schedule. Results for the schools monitored in 2022 are in appendix C. In addition, hot spot monitoring for 1 month NO2 at any school that requests it, was re-instated in 2022, post COVID. Annual monitoring continued throughout 2022 at 6 sites in and around East Sheen Primary School on the South Circular, post implementation of the extension of the ULEZ to the north and south circulars.
1.7	Monitoring and other	Implement a new interactive AQAP, which will be updated regularly to	Ongoing.

	core statutory duties	provide transparent and concise updates to measure our performance as a borough. Air quality data to be updated quarterly.	AQAP was finally adopted by Cabinet on 10/3/20 and the new AQAP is available on the Council website. Air quality data is now updated quarterly on the Council website here
1.8	Monitoring and other core statutory duties	Invest in new monitoring equipment as new technology moves forward. This could see enhancement to the diffusion tube network and help provide real time data	Target: 1 or 2 new monitors per year to be tested. Various products under consideration In 2022, as part of the South London Partnership, LBRUT ran 45 x real time “low cost” air quality sensors monitoring NO2 and PM2.5’s borough wide. These were installed and commenced monitoring, late in 2021 and a reduced number will continue throughout 2023. In October 2020, it purchased 25 x personal pollution monitors for school and Council staff to help them better understand their own exposure to air pollution. These were used ad hoc throughout 2022 to help pupils and residents better understand exposure on their walk to school, work or leisure activities. In 2019/20 LBRUT took part in Breathe London funded by the Mayor of London, gaining 3 x AQMesh low cost, real time air quality sensors in Richmond and Twickenham town centres and outside East Sheen Primary School.
2.1	Emissions from developments and buildings	New buildings and development. We have embedded air quality in our Local Plan and will produce a Supplementary Planning Document (SPD) that will help to deliver our aspirations for cleaner air in the borough. This document will cover all areas of planning and ensure developers focus on air quality throughout the build and for the life of the development	Ongoing. Air Quality is now embedded in our Local Plan and the borough adopted a new Richmond specific AQ SPD in June 2020, focused on the council’s priorities for new developments, including formalising the Section 106 conditions. The AQ SPD is now applied to all major planning applications, which reinforces the Mayor’s requirements relating to AQ neutral for both buildings and transport. The AQ Officer requests S106 payments wherever possible from developers as part of mitigation measures on major developments. LBRUT push for AQ positive and healthy streets approach in major developments (Stag Brewery) at the pre-app stage for maximum benefits and inclusion. Car free developments are requested wherever PTAL rates permit. If parking is required, it is requested as a block near entrance. Car club spaces as per LBRUT AQ SPD and electric vehicle charge points as per London Plan plus robust travel and servicing plans are conditioned. Opportunities for local district heating network are identified wherever possible. Green space is important to LBRUT, so a lot of effort and negotiation both at pre-app and planning stage now takes place with developers and planners to ensure adequate, appropriate

			and well located green space is retained/ made available in all new developments; all mature trees are retained wherever possible, often aided by joint working of EH with Parks dept.
2.2	Emissions from developments and buildings	Delivering Cleaner Construction: demolition and construction can have a significant impact on local air quality. We will ensure that sites are regulated in accordance with the Mayor of London's Non Road Mobile Machinery (NRMM) LEZ where this is applicable. This project is currently being delivered throughout London by our joint regulatory service	LBRUT, together with LB Merton are mindful of the large proportion of emissions contributed by NRMM. All major sites are therefore visited and requirements enforced by our London wide NRMM team based in our LB Merton offices. Latest NRMM regulations are routinely applied and planning officers are updated. In 2022, as in 2021, EH at LBRUT requested from Planning that NRMM conditions be imposed on 100% of all major construction sites. Compliance rates for NRMM equipment, on arrival at inspection by the NRMM team was 100% - 60% compliant and 40% self-compliant, which is excellent. As time goes on, construction appear more aware of requirements. Continued inspection, however is considered very important. For NRMM details, see table K.
2.3	Emissions from developments and buildings	Continue to raise awareness of the fact that the whole borough is covered by a smoke control order and provide information to suppliers of solid fuels on restrictions within the borough. Actively press for more regulatory powers to cover the impact of wood burning appliances.	LBRUT accept that solid fuel burning is a major source of PM2.5 (23 -31% in London) that must be controlled at the local level. Addressing this source is crucial for achieving the LES target to meet WHO guideline levels for PM2.5 by 2030. Wood burning stoves and open fires are popular in LBRUT. In 2022 EH investigated all complaints on smoke control. In Autumn/Winter 2021/2 and again in 2022/23 communications ran a campaign on the Council website, social media and by e-letters to residents; letters to businesses who sold fuel and/or appliances reminding them of new requirements in smoke control areas. LBRUT 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. In 2020, bonfires were banned on all Council allotments at all times.
2.4	Emissions from development	Promoting and delivering energy efficiency and energy supply retrofitting projects in workplaces and homes through EFL retrofit programs	The Climate Change team at LBRUT worked on many projects throughout 2022, including the use of central government funding for the Green Home Grants. This enabled work to take place to improve properties that have poor energy efficiency where household incomes are under £30k.

	s and buildings	such as RE:FIT, RE:NEW and through borough carbon offset funds.	Phase 1b of Green Homes Grant completed in June 2022, with installations completed at 61 homes resulting in 666kg of carbon savings through improvements such as insulation, new windows and doors, solar panels and heat pumps. Phase 2 launched at the start of 2022 and completed in September 2022, with installations completed for 69 homes resulting in 654kg of carbon savings. Phase 3 is underway, with installation due to complete at the end of September 2023. Richmond took part in the Solar Together scheme commissioned by the Mayor of London, a scheme to offer a group discount for the installation of solar panels on homes borough wide. Phase 4 closed in 2022, with 69 installations over the scheme in 2021/22, saving an estimated 89.7tCO2e. Phase 5 of the scheme was promoted to residents in 2022, with installations underway and delivery due to complete in May 2023. This is essential to help towards achieving the ambitious target for London to be a zero carbon city by 2050.
2.5	Emissions from developments and buildings	Reduced emissions from council operations, including from buildings, vehicles and all activities.	Richmond Council's scope 1 and 2 emissions in 2021/22 were 1,953 tCO2e. This represents an overall decrease in emissions for 2021/22 compared to 2020/21 of 26.3% and the baseline levels in 2017/18 of 72.5%. Most reductions for 2021/22 were from Scope 2 emissions, due to the Council purchasing zero carbon electricity and also due to the ongoing decarbonisation of the National Grid as power generation increasingly moves away from fossil fuels. The Council has developed and is delivering a Decarbonisation Strategy, which sets out a programme of works, which, over time, will reduce energy usage across its portfolio of buildings and reduce its Scope 1 and 2 emissions. Phase 1 of the works are nearing completion and Phase 2 of the programme is in development. Installations have included building fabric upgrades such as insulation, LEDS, building management systems, heat pumps and solar panels. LBRUT has installed solar panels on the roof of the Civic Centre, insulated original windows in listed buildings, upgraded Council fleet and set conditions for contractor fleet through procurement. The Council fleet now consists of 1 x zero emission (EV), 59 x Euro VI and 1x Euro V.
3.1	Public health and awareness raising	A new communications strategy developed in partnership with the community and updated regularly to highlight initiatives and campaigns. This action plan needs to be owned	The new communications plan is updated quarterly by LBRUT communications dept. All initiatives are shared and promoted wherever possible, such as idling action awareness raising, Clean Air Day, Car Free day, Bike week, walk to school week, wood burning and more.

		by the community and not just the council. Many groups in our borough are actively tackling air pollution and raising awareness and we need to capture and promote this work	New community webpages, as part of the AQAP, were requested by the community to discuss the draft AQAP pre-launch. Once the pages went live and going forward community updates and input on local initiatives are encouraged. This is seen as a useful place to share knowledge.
3.2	Public health and awareness raising	We will actively lead in important campaigns and initiatives that raise awareness within the borough, including clean air day, car free day, airTEXT and idling action campaign events, as well as proactive measures such as the use of road closures and park-lets .	LBRUT aim for at least 4 campaigns a year. For Clean Air Day on 16/06/22, we ran an in-person event at Richmond rail station, which included a Council information stall on air quality and active travel, air pollution themed street performers and a popular free ecargo-bike taxi service from the station to local destinations. We also had a Dr Bike stall for basic bike checks. We launched an online Clean Air Challenge; local businesses were encouraged to reduce their air pollution contributions with suggested actions; and schools were encouraged to take part in online activities, including a quiz, citizen science and creating low air pollution walking route maps. Car Free Day on 22/09/22 was impacted by the passing of Her Majesty the Queen. The blackout period prevented the planned social media campaigns to promote active travel for residents and businesses. Despite this 24 x play streets were closed free of charge by the Council over the weekend of 24/25 Sept 2022. The Council promoted the Ask about Asthma campaign, consisting of four Asks and online events to schools, residents, and the local NHS ICB, both directly and via a social media campaign (postponed due to the passing of Her Majesty the Queen to 03/10/22). Idling workshops were delivered to three Primary schools through the Idling Action London project prior to its conclusion at the end of March 2022. It was decided to continue idling action events in-house. In 2022, 11x Idling Action events took, including at four schools (for Officers only) with the remainder supported by volunteers and Councillors. The events engaged with a total of 881 drivers, not all of whom were idling, with 412 pledging not to idle in the future. In 2022, traffic wardens engaged with 11,425 drivers idling their engines and required switch off. AirText, an early warning alert service for days of moderate or high air pollution levels, was supported and promoted on the Council website, to schools, and in response to complaints and enquiries throughout 2022. LBRUT view AirText as a critically important service providing direct alerts to vulnerable people. Alerts are automatically forwarded to doctor's surgeries, schools and pharmacies. LBRUT consider this a low-cost way to raise awareness and reduce exposure amongst the most vulnerable. In 2022 Church Street Twickenham remained closed to traffic 10am – midnight daily.

3.3	Public health and awareness raising	We will create a new Air Quality & Transport Committee specifically to look at Air Quality and actively engage with the community	A single Transport and Air Quality Committee was created to integrate transport and AQ in all decision making on a fundamental and daily basis with one cabinet member covering both departments. Officers organised community group meetings to listen to suggestions from representatives' borough wide. This helped structure the new AQAP and the two large, well-attended Air Quality and Climate Change summits in Oct 2019. This put Air Quality and Climate Change high on the political agenda and in 2022 resulted in much joint working between Air Quality and Climate Change departments on issues such as clean and green High St recovery and new e-cargo bike schemes (CAV4, see 4.1) and clean, electric ice cream pitches (see 7.5)
3.4	Public health and awareness raising	We will work with our Public Health partners and look at the opportunities to join up our campaigns and to deliver joint health benefits of active travel and healthy lifestyles	In 2022 Public Health, assisted by Environmental Health, won a GLA Superzone bid. As part of the GLA Superzone Project, both Public Health and Environmental Health have worked together to focus on air quality interventions at Nelson Primary School in Whitton (near a busy road with higher levels of air pollution) including undertaking of an air pollution audit, installation a green screen and fence panels between the road and school playground to reduce exposure to air pollution by pupils. A real time Breathe London node and 4 x diffusion tubes have been installed to monitor air pollution levels in and around the school. In 2022, meetings continued with PH to deliver joint messaging for health and air quality benefits for numerous strategies around schools, dementia, and the equalities agenda. These followed on from a training module, developed by PH, with input from the air quality team in LBRUT, to help front line NHS workers deliver joint air quality messages to vulnerable patients especially those with breathing or heart problems, in the community and schools, via "make every contact count".
3.5	Public health and awareness raising	We will work with our Communications Team to promote the use of low pollution, back roads for walking or cycling to reduce individual exposure to air pollution	The Air Quality team is working closely with Active Travel, School Travel Planner, schools, communications and via local presentations to promote low pollution walking routes. These were also promoted, alongside activities to schools on Clean Air Day and Car Free Day 2022.
3.6	Public health and awareness raising	We will create a joint action working group that will actively involve communities in the air quality agenda and that reports to the Chair of the new Air Quality & Transport Committee	This was created to inform and shape the new AQAP. Despite COVID, it met online in November 2020 and twice in 2021. In 2022, we reverted to hybrid meetings to try and accommodate all. Useful presentations, updates and information on the air quality agenda were provided and members raised various issues, which were answered or investigated by the Air Quality Team.
3.7	Public health and	We will increase the number of schools with accredited travel plans by 20% per year with an aim to have	LBRUT has a part time Travel Planning Officer to help schools draw up travel plans. LBRUT also organise road safety talks and encourage walking/cycling to school. LBRUT encourages all

	awareness raising	up to 90% of all schools covered by 2024. We will encourage all schools to join TfL STARS programme.	schools to sign up to the TfL STARS accreditation scheme. In 21/22 academic year 43 (53%) schools had TfL STARS accredited STP's. All year 6 pupils receive cycling proficiency training before they leave for secondary school. LBRUT also helps schools introduce road safety schemes such as school streets. In 2020, LBRUT introduced 14 school streets, a significant increase from the 3 that were originally planned, pre COVID-19. In 2021, following consultation, 14 were made permanent. In 2022/23 academic year 1 more was made permanent and 1 more is being trialled as part of Phase 3.
3.8	Public health and awareness raising	Better Legislation: We will actively campaign and participate in the call for a new Clean Air Bill that is fit for the future.	LBRUT together with other London authorities and London Councils continue to attend meetings with Defra and respond to consultations, including on Defra's Environment targets, the latest Air Quality Strategy, PM2.5's, and smoke control legislation to try to strengthen targets and standards.
3.9	Public health and awareness raising	Burning in the borough: We receive regular complaints and concerns from residents about bonfires in the borough.	We have banned bonfires on all borough allotments and may consider further restrictions. Bonfires are a major source of harmful PM2.5's. We have substantial online information, strongly discourage all forms of burning, have contact forms and a contact number and respond to all complaints about bonfires. We take swift enforcement action against builder's bonfires. LBRUT witnessed an 800% increase in bonfires in April 2020 when compared to April 2019 when due to COVID-19 the Council Reuse and Recycling Centre was closed. LBRUT had serious concerns at the TfL's refusal to exempt the Council tip from the extended ULEZ in Oct 2021, despite being a cul-de-sac sited just 0.1 mile within the South Circular. The Council had concerns that residents with non – compliant vehicles, living in the 2/3rds of the borough outside the extended ULEZ, may resort to bonfires to get rid of certain waste material rather than pay the £12.50 fine to visit the Reuse and Recycling Centre. To what extent this is true is unknown.
3.10	Public health and awareness raising	The impact of burning unauthorised fuel and the use of wood burning appliances is becoming more of an issue. We will lobby Government for additional powers to control burning unauthorised fuel and the use of wood burning appliances. We will take action to address any complaint regarding unauthorised use.	The whole of LBRUT is a smoke control zone. The Council receives complaints about smoke from a chimney every year. All reported cases are investigated and enforced. Every year for the last 4 years, it has launched smoke control campaigns for residents and written to all businesses that sell fuel and/or appliances with posters to inform customers at point of sale. An officer from LBRUT is on the newly formed GLA Wood burning Working Committee and LBRuT was part of the successful Defra bid to assess health impacts in smoke control areas. This appointed Imperial College London to carry out in depth research in Autumn/Winter 2022/23 and to use the results to inform a professional London wide awareness raising campaign in 2023/24.
3.11	Public health and	Audit all schools in areas of poor air quality and provide financial support	LBRUT has a target to audit all schools in areas of poor air quality. The Pollution team with the Mayor's team have completed audits at the 3 schools in areas of poorest air quality – St

	awareness raising	for measures that tackle and reduce exposure to pollution	Stephens Primary School, East Sheen Primary School and Windham Nursery School. All received substantial reports with short, medium and long-term recommendations. The 2 x Primary Schools received £10,000 from both the Mayor and LBRUT to help deliver improvements. From modelling, no other schools are in areas that exceed UK/EU annual limit values for NO2. However, from late 2021 and throughout 2022 we continued to deliver in house air quality audits at other Primary Schools in LBRUT, with a target of 1 school per term. Reducing exposure on the walk to school is also considered important. LBRUT encouraged all schools to focus on cleaner walking routes to school for Clean Air Day 2021 and post these on their websites.
4.1	Delivery servicing and freight	Develop plans for business engagement, including optimising/greening deliveries, supply chain and waste removal	In 2021, the business development section of LBRUT supported a new initiative by Mytowns for a clean next day delivery service by ecargo bike serving local High Streets within the borough. In 2022 Mytowns had a number of difficulties, streamlined their operation and rebranded to Onlinehighstreet. To support their commitment to sustainability, they utilised cargo bikes or fully electric/hybrid vehicles for most deliveries, and in London, they partner with couriers such as Packfleet, Quiver, and Zedify. They advise that 91% of their deliveries within the borough and within London are now zero emission.
5.1	Borough fleet	Richmond will upgrade its own fleet and that of our suppliers to the highest Euro Standards	Reducing emissions from LBRUT's own fleet and that of contractors is seen as key. LBRUT believes it is very important to lead by example, so has a target for the entire fleet to be the latest Euro standard or electric by 2024 By Dec 2022 97% (59 vehicles) of LBRUT's fleet was latest Euro VI, 1.5% (1 x vehicle) Euro V and 1.5% % (1 x vehicle) was zero emission. Contractors are incentivised to use clean fleet via procurement (see 2.5)
6.1	Localised solutions	The introduction of a borough-wide 20 mph speed limit. This will help create an environment that is welcoming and safer for pedestrians and cyclists	The installation of 20 mph speed limit in over 90 % of all LBRUT roads was completed by April 2020 (implemented in 24 segments). This has helped create an environment that is welcoming and safer for pedestrians and cyclists to help encourage and increase the mode share for walking, cycling and public transport, particularly important as we develop the "new norm" post COVID.
6.2	Localised solutions	Independent assessment of the air quality benefits of the new 20 mph speed limit - monitor 3 locations before and after 20 mph limit implemented	Completed. A report was commissioned to review impacts on air quality before and after the introduction of the borough wide 20mph speed limit. Unfortunately, due to COVID and the large number of changes in life styles, which affected traffic 2019 to 2020, it was not possible to establish either a positive or a negative effect of speed on levels of air quality. Air quality did improve generally in 2020; it declined slightly or remained the same in 2021 and it has improved at most sites in 2022. Any impact from speed alone is not possible to ascertain.

			Speed did reduce with the new 20mph. The traffic survey in early 2021 comparing 2018 to 2020 confirmed a reduction in speed on most roads, contrary to increased speeds affecting much of London during lockdown.
6.3	Localised solutions	Additional speed reduction measures at A310 Kingston Bridge to Twickenham, A305 Staines Road Corridor and A308 Hampton Court Corridor	These three corridors - A310, A305 and A308 were identified for corridor studies and were taken forward in 2022/23. Works on the A310 corridor commenced in 22/23 with the construction of a part segregated cycle lane along the length of Strawberry Vale/Manor Road. This scheme is near completion in May 23, works were delayed due to delays in receiving materials. The works on Hampton Court Road outside the Palace were delayed pending approvals from the Palace given that they part own the land to the front of the Palace. This approval has now been granted to proceed and consultation is expected on the new proposals in June/July 2023. Staines Road did not receive funding sufficient for traffic calming the length of road in 22/23. However, consultation has been undertaken in early 2023 for a parking proposal with safety improvements around junctions included. The results of this consultation are currently being assessed and it is hoped that some measures, including the introduction of a lower 20mph speed limit, may be introduced later this year between the junctions of Fifth Cross Road and Sixth Cross Road. Funding has also been secured to review the section between Sixth Cross Road and the A316 junction, albeit this is only sufficient for design; additional funding would need to be secured for implementation of any measures arising from this review.
6.4	Localised solutions	A new Clean Air Zone (CAZ) for Richmond Town Centre. This is the most polluted location in our borough and a hot spot for through traffic. We will tackle this by introducing a new Clean Air Zone with the ambition of reducing polluting vehicles and dissuading vehicles from unnecessarily using our town centre as a through route (subject to funding approvals)	LBRUT commissioned baseline data in Autumn 2019 with a view to bringing in the proposals for Richmond Town Centre by 2021. COVID 19 resulted in delays and fresh thinking. LBRUT is now considering wider plans for Richmond town centre which may go above and beyond a CAZ. A long term, far reaching package of wider interventions intended to improve air quality, public realm and the walking and cycling environment in Richmond town centre is being considered. The Council is close to appointing a specialist engagement consultant for gathering thoughts and opinions for directing the focus for the project, Progress will be updated in the 2024 ASR.

6.5	Localised solutions	Focus our policies and Local Implementation Plan on prioritising cycling and walking in the borough	Richmond Council published its Active Travel Strategy in 2020. The strategy includes a detailed list of actions that the council is pursuing to increase walking and cycling in the borough, including a strategic cycle network connecting the key town centres. Despite the pandemic, progress was made towards establishing this network with cycle improvements delivered on Kew Road, Hampton Court Road and Castelnau, with further improvements in development for Hampton Court Road, Hampton Wick Roundabout, Strawberry Vale and Staines Road. The target delivery date is 2024. Other works currently being assessed for cycling include a review of London Road in Twickenham in addition to a detailed assessment of the London Rd/Whitton Rd signals for cycle improvements, this is part of the strategic cycle route. Works commenced on this study in 22/23 and it is expected that consultation on proposed measures will be undertaken in Autumn 2023. Works continue on the introduction of contraflow cycle schemes in the borough with planned lanes for Park Road Hampton Wick and East Twickenham area imminent. Other measures introduced in 22/23 include a new zebra crossing on Broad Lane (junction of Wensleydale Road) and a new zebra crossing on Meadway (River Crane crossing) to facilitate and encourage walking. Detailed design has been undertaken on a number of new crossings planned for implementation in Summer 2023 including The Vineyard School, Meadlands School and Wellington Road (junction of Fulwell Road). The target delivery date is 2024.
6.6	Localised solutions	Continuing the roll out of Electric Vehicle Charging in the borough. Target. of 400 EV charging points by 2025	Ongoing - ambition to exceed target. Target achieved in 2021. Ambition to achieve more. LBRUT is keen to enable and encourage uptake of zero tail pipe emission vehicles in preference to petrol or diesel vehicles. It accepts the need to provide space on borough roads and in borough car parks for an effective network of charging points of different types to cater for all users. The majority of charge-points are lamp column chargers on residential roads catering for residents without off street parking A total of 420 public charging points (sockets) are available in LBRUT comprising 337 slow (lamp column) 78 fast (Source London) and 5 rapid (TfL). A further phase of lamp column chargers originally planned for 2022 was delayed but has been increased in scale so that 525 chargepoints should be delivered in 2023, more than doubling overall capacity. The Council is continuing to investigate options with private sector providers for further fast/rapid charger provision at no cost.

6.7	Localised solutions	Investing in Cycling Infrastructure in the borough - 1000 Cycle stands, 30 Cycle Hangers, 200+ Cycle Racks by 2023	The borough is working to rapidly expand its residential bikehangar programme, with 20 new units installed in 22/23 and 15 more to be installed in early 23/24. The programme provides secure cycle storage for residents that cannot easily store bicycles within their homes. This is in addition to cycle infrastructure installed in 2021, when LBRuT installed 18 bike hangars across LBRUT plus 68 Sheffield stands located on-street in various locations borough-wide, providing parking spaces for 136 bikes. We are likely to exceed all cycling infrastructure targets including 1000 cycle stands by 2023. LBRUT does not monitor the number of cycle parking stands installed as part of new developments – they are conditioned as per London Plan 2021 and noted as part of the planning application but cumulative totals are not available. This is now becoming an important addition particularly for residential cycle parking.
6.8	Localised solutions	To reduce traffic around schools at drop off and pickup times we will be piloting 'School Streets' at selected schools with a view to extend these in the borough	Richmond Council is endeavouring to promote active travel to school, alongside improved safety and air quality. LBRUT had a target of 3 school streets in March 2020. This target was significantly increased in 2020 during COVID to help with both safety and social distancing around schools. By October 2020 15 temporary schools streets had been installed under phase 1 and 2. In 2021 13 School Streets were made permanent and 3 more were consulted upon. In 2022 an additional school street was made permanent. In 2023 1 further School Street is being trialled and 1 is still under consideration. We are currently finalising the list for Phase 4 which will commence in 23/24 academic year with consultations prior to trials. In 2022-24 the political vision for Schools Streets is to improve the visibility of the existing school streets rather than push for many more new ones.
6.9	Localised solutions	Pilot internal air quality filtration in schools and take part in GLA assessment in effectiveness of different filtration units at nursery schools	Completed. Air filtration units were piloted at 2 x primary schools 2019 – 2020. This pilot is now complete. It emerged that performance was dependent on routine maintenance - i.e. schools replacing/cleaning filters when necessary, which effected the value of the intended report. COVID and funding issues further disrupted this. In 2019, the GLA carried out an audit of 20 nursery schools in London including Windham Nursery School in LBRUT. All received reports and joint funding from the GLA and local authority to help with recommended improvements. In addition, the GLA selected 5 nursery schools for a detailed survey of 5 different air filtration systems. This resulted in a more robust report on the effectiveness of air pollution purifiers here
7.1	Cleaner transport	We will commission a Diesel Levy options paper and impact baseline	Ongoing. Will be considered in conjunction with the outcomes of the ULEZ

		for the borough. The implementation and the scope of that implementation will be considered at the Air Quality & Transport Committee. We will also benchmark against other leading boroughs that have considered and are implementing charges linked to vehicle emissions	An Emissions based parking levy report was completed in May 2020 looking at 5 options to address both harmful effects of traffic fumes and Climate Change Impacts to support a zero emission target for London by 2050. It reviewed a 2018 report on emission-based resident parking and considered options adopted elsewhere. LBRUT would like to incentivise and encourage a switch to cleaner vehicles. Officers need to check with members if this is supported especially with the ULEZ expansion proposed for August 2023 being progressed by TfL. This will be done during this financial year (2023/24) and further updates will follow. Decisions/progress will be updated in ASR 2024.
7.2	Cleaner transport	Anti-idling: This is a priority action for the borough and we will be working tirelessly within given resources to ensure that this is tackled for all vehicles including taxis	This is a top political priority. In 2022, traffic wardens engaged with 11,425 drivers across LBRUT, warning drivers to switch off. All drivers complied, so no FPNs were issued. This was the 4th year of CEO enforcement and a total of over 42,500 warnings have now been issued. This is far higher than many other London authorities. From Autumn 2021 onwards, LBRUT restarted Idling Action events as part of the Mayor's campaign and also organised their own in-house events, some with volunteers and Cllrs, largely around level crossings but also around schools and hotspots in response to complaints. This continued throughout 2022, with 11 idling events. LBRUT created its own pledge for engine idling for businesses and schools. It encouraged all schools to pledge not to idle and issued large banners to those that signed up, which are displayed as reminders to motorists on boundary fences. In 2022, LBRUT responded to all complaints where possible regarding company vehicles, contacting companies directly to raise awareness of engine idling. Toolkits and online tutorials were forwarded and promoted. All complaints were responded to and additional signage requests were investigated and erected where practical. Much work has also been carried out with black cabs outside Richmond and Twickenham stations, talking to drivers, talking to TfL, publishing articles in trade magazines and Idling Action events at taxi ranks. Most taxis are now compliant.
7.3	Cleaner transport	We need to lead by example so we will be developing a 'benchmark test' to gauge the impact of internal decision making around factors such as procurement	LBRUT has developed a benchmark test for procurement to help influence and incentivise suppliers to use the cleanest vehicles possible to reduce pollution from Council/contractor logistics and servicing. Euro VI/EV's are required on new contracts and has been required for the new 10 year waste and recycling contract commencing 1/4/20.This represents a substantial improvement on the former fleet and will help reduce emissions borough wide.

7.4	Cleaner transport	Tackle Council work place emissions and promote the Council Travel Plan to the Council employees	One of the most significant legacies of COVID – 19 is the change in work patterns and the increase in working from home. LBRuT continued to encourage working from home where practical in 2022 and will continue so to do. This will help reduce emissions from travelling to/from work. Throughout 2022 the Council continued to promote healthier travel habits for its staff, including walking, cycling and using public transport for business visits. Work Oyster cards are provided for business travel/site visits on public transport. Cycle to work scheme is encouraged. Cycle facilities on Twickenham campus include showers and changing rooms. Staff cycle parking is increased by removing car parking bays as demand increases. The Council has become a corporate car club member. Parking is only provided for essential car users, usually for 2 days a week. Free parking for all other officers, of all grades, has been abolished. All initiatives will help reduce emissions.
7.5	Cleaner transport	Licensing & Idling: We have a problem in the borough with food and ice cream vans that contribute to pollution when servicing certain areas. We will seek to ban diesel emissions when serving ice cream and require all non-itinerant food vans with licensed pitches to plug into an electrical source. We will work with our partners in our Licensing Team to introduce conditions at annual license renewal that provide the above controls to tackle this idling	LBRUT introduced this policy in its AQAP in March 2020 to address a specific concern with idling ice cream vans and food vendors. In 2022, the Air Quality team progressed this action with the Licensing and Climate Change teams to fund free electrical plug in points for all non-itinerant mobile food vendors by 2024 and to make it a condition at annual license renewal to plug into an electrical source. This went to Licensing Committee on 31/1/23, which means from this date, all new traders must be euro 6 and plug into an electrical feeder pillar where one is supplied by the Council for power whilst trading. No idling will be permitted. Existing traders must be euro 6 compliant by 1/1/24 and likewise plug into an electrical feeder pillar where one is supplied. By December 2022, LBRUT had 6 x electrical points installed for mobile food vendors, with dates for a further 2 to be completed prior to summer 2023 trading. The last 2 electrical installations on Hampton Court bridge are proving problematical due to running cable below the road and issues with the structure of the bridge. It hopes to resolve these with UKPN shortly. Money has been provided internally through the Climate Change fund. LBRUT would like to combine this with more business engagement, help for street vendors and help for more local businesses. In their bid to the Climate Change fund, the Air Quality team have proposed dual use pitches – ice cream in summer, hot refreshments in winter for our parks and open spaces – all newcomers to be electric, clean and green from outset. Updated licensing policy means that all ice cream vans must be euro 6 compliant and run off electricity whilst trading from 1/1/24.
7.6	Cleaner transport	Support the development and use of ‘Car Clubs’ in new residential	Car clubs operate throughout the borough and are positively endorsed by the Council. In 2022, there were 72 car club bays available to the operators Enterprise Car Club and Zipcar.

		developments, by station interchanges and in town centres.	The free-floating car club Zipcar Flex completed a full year of operation in the north of the borough in 2022. Over the calendar year an average 31 vehicles have been available daily, of which around a third have been pure electric vehicles. Year on year, from Q4 2021 to Q4 2022 the average number of members using the service each month grew from 843 to 1,158 and the average number of trips made per month grew from 1,791 to 2,574. Car clubs are encouraged at all new residential developments through the planning system. Throughout 2022 car clubs were promoted and conditioned in residential developments across LBRuT via robust travel plans. The Council's AQ SPD requires developers in larger developments to pay membership for a minimum of 2 years to the car clubs on behalf of the occupiers. Where possible, they must also provide space for car club bays on site, to encourage the switch from private ownership and make car clubs convenient and accessible. Following a review in late 2022 the council is set to expand car club operation in 2023 bringing in more operators using additional locations.
7.7	Cleaner transport	Tackle idling vehicles at schools as a priority	Traffic wardens target schools at pick up time on a regular basis. This was paused in COVID but continued throughout 2021 and 2022. In 2022, active travel plans were encouraged and 14 school streets became permanent, encouraging more walking, scootering and cycling. This was considered a better option than targeting idling alone. However, traffic wardens and our Idling Action events, continued to regularly target non school street schools at collection time.
	New projects for 2021		**Updates**
1.9	Monitoring and other core statutory duties	Further Investment in new monitoring equipment as new technology moves forward. This could see enhancement to the diffusion tube network and help provide real time data	In 2021, LBRUT won a joint bid for the 'Internet of Things' with the South London Partnership and by October 2021, had installed 45 x Breathe London air quality sensors to enhance NO2 with real time monitoring and introduce real time PM2.5 monitoring borough wide. This meant for the whole of 2022 the Council had an additional 45 x real time air quality monitors. Results are available on the breathe London website - https://www.breathelondon.org/. This was a much sought after development by residents and members and is being used to help inform policy. It has been taken in house, reduced but continued for 2023.
7.8	Cleaner transport	Participation in London E-scooter rental trial - June 2021	LBRUT is one of the participating boroughs in the TfL London e-scooter rental trials. Over the trail period from June 2020 to 20th Nov 2022, 2,020,000 trips had been carried out by e-scooter across the London trial. Not surprisingly hire of e-scooters is more popular summer to winter. Below is a breakdown for the e-scooter trip data (to the nearest 100) for Richmond in this period:

<table>
<tr><td></td><td></td><td></td><td>
<table>
<tr><th>Trial period</th><th>Trips</th></tr>
<tr><td>TP 12 (11 Apr-8 May 2022)</td><td>3680</td></tr>
<tr><td>TP 13 (9 May-5 Jun 2022)</td><td>3500</td></tr>
<tr><td>TP14 (6 Jun -3 July 2022)</td><td>4420</td></tr>
<tr><td>TP 15 (4 Jul -31 Jul 2022)</td><td>4180</td></tr>
<tr><td>TP 16 (01 Aug-28 Aug 2022)</td><td>3990</td></tr>
<tr><td>TP 17 (29 Aug-25 Sep 2022)</td><td>3500</td></tr>
<tr><td>TP 18 (26 Sept-23 Oct 2022)</td><td>2670</td></tr>
<tr><td>TP 19 (24 Oct-20 Nov 2022)</td><td>2740</td></tr>
<tr><td>TP 20 (21 Nov-18 Dec 22)</td><td>2300</td></tr>
<tr><td>TP 21 (19 Dec-15 Jan 23)</td><td>1560</td></tr>
<tr><td>TP 22 (16 Jan-12 Feb 23)</td><td>1630</td></tr>
</table>
For more details see https://tfl.gov.uk/corporate/publications-and-reports/electric-scooter-rental-trial
</td></tr>
<tr><td></td><td>New projects for 2022</td><td></td><td></td></tr>
<tr><td>7.9</td><td>Cleaner transport</td><td>Cargo bike hire scheme</td><td>In May 2022, three cargo bikes were delivered to host locations in East Sheen, Hampton and Teddington as part of the Richmond cargo bike hire scheme. The bikes have been hired 383 times by 207 members and have covered 797km, including 545km that would have been travelled using vehicles fuelled by diesel or petrol. As part of the second phase of this programme, the Council plans to deliver another 6 cargo bikes in summer 2023 so that other communities, including Twickenham, Richmond Town Centre and Ham, can take advantage of their benefits. The scheme is delivered in partnership with Peddle My Wheels.</td></tr>
<tr><td>7.10</td><td>Cleaner transport</td><td>Dedicated parking bays for e-cargo bikes</td><td>Progress is being made with the Council’s plan to introduce dedicated parking bays for cargo bikes across the borough. In November 2021 the transport committee approved the designation of up to 25 cargo bike parking bays across Richmond. The plan is to convert existing car parking bays near destination points for young families, i.e. primary schools, playgrounds and libraries. We are already engaging with local councillors, schools and residents in 18 locations. The bays</td></tr>
</table>

			would be installed under an experimental traffic order for the first 6/12 months, feedback will be monitored before a decision is made as to whether the bays are made permanent. Updates will be given in the 2024 report.
6.10	Localised solutions	Public realm improvements focused on enhancing pedestrian spaces	Construction on the A310 Strawberry Vale started in January 2022, as did the public realm focused project in East Twickenham. A wider programme of public realm focused projects are also underway at various high streets across the borough, including Broad Street, Ham Parade, Hampton Wick and Castelnau. The projects are all focused on enhancing spaces for pedestrians, including the introduction of trees, plantings and SUDS.
3.12	Public health and awareness raising	Public Health's Air Pollution Action Plan - focus on targeting vulnerable groups and communities, providing information on health and air pollution and raising awareness in the community via outreach possibly via the Public Health Bus.	This is work in progress. Public Health is working closely with the Air Quality and Climate change leads to contribute to a corporate communications and engagement plan to help raise awareness about air pollution, climate change and its impact on health , co-benefits of climate change , air quality and health and simple tips on how to reduce the impact. Public Health is contributing to the corporate Air Pollution action plan , working with commissioning colleagues to develop a commissioning and procurement guidance and prompts for officers on how to embed air quality , climate change and health co-benefits as part of any strategy and policy development or for commissioning and procurement.

3. Planning Update and Other New Sources of Emissions

Table K. Planning requirements met by planning applications in London Borough of Richmond upon Thames in 2021

Condition	Number
Number of planning applications where an air quality impact assessment was reviewed for air quality impacts	22
Number of planning applications required to monitor for construction dust	7
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	0
Number of developments required to install Ultra-Low NO_x boilers	22 (all 22 likely to install non combustion)
Number of developments where an AQ Neutral building and/or transport assessments undertaken	22
Number of developments where the AQ Neutral building and/or transport assessments not meeting the benchmark and so required to include additional mitigation	5
Number of planning applications with S106 agreements including other requirements to improve air quality	6
Number of planning applications with CIL payments that include a contribution to improve air quality	0
NRMM: Central Activity Zone and Canary Wharf Number of conditions related to NRMM included. Number of developments registered and compliant. 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 IIIB of the Directive and/or exemptions to the policy.	N/A
NRMM: Greater London (excluding Central Activity Zone and Canary Wharf) Number of conditions related to NRMM included. Number of developments registered and compliant. 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 IIIA of the Directive and/or exemptions to the policy.	22 conditions included 8 registered and compliant 0 unregistered/uncompliant 0 sites were complete upon engagement 3 sites had no NRMM within scope (37-560kW)

NRMM is a standard planning condition applied to all major developments. In 2022, the Principal Air Quality Officer emailed current NRMM conditions to the Head of

Planning and ensured all Planning Officers were reminded of requirement to add NRMM to all planning applications. Reminders were given to staff at team meetings in 2022. The RSP (LB Merton, LBRUT and LB Wandsworth) have 6 designated Officers based in Merton, who assess all major sites for NRMM compliance, visit sites and check the NRMM database for compliance in line with the Mayors Supplementary Planning Guide for Control of Dust and Emissions during Construction and Demolition.

All major developments are passed to the Noise and Air Quality Officers in Environmental Health for comment. All major developments are required to submit an AQA. All relevant national, Mayoral and LBRUT local policies are applied by Environmental Health to all responses to Planning in all cases. Sites are considered for construction dust on a case-by-case basis, monitoring required and locations agreed, where a moderate or high risk to receptors is predicted. LBRuT received no applications for use of CHP/biomass in 2022, which has been actively discouraged. Consultants and developers are more often proposing non-combustion, maximum insulation and renewables to increase BREEAM ratings and only occasionally request ultra low NOx boilers, which are now discouraged. Requirements are as per London Plan, which meant none could be refused on grounds of AQ in 2022, although mitigation was required.

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 Richmond upon Thames Fleet

The London Borough of Richmond upon Thames has a relatively small fleet; it has no Council housing; Waste and Recycling and Parks are contracted out.

By Dec 2022 97% (59 vehicles) of LBRUT's fleet was latest Euro VI, 1.5% (1 x vehicle) Euro V and 1.5% % (1 x vehicle) was zero emission.

LBRUT's fleet consists of 1x zero emission (EV), 59x Euro VI and 1x Euro V.

4.2 NRMM Enforcement Project

The London Borough of Richmond upon Thames continues to support the NRMM Enforcement project in 2022 – 23.

4.3 Air Quality Alerts

The London Borough of Richmond upon Thames continues to support *air*TEXT (https://www.airtext.info/) and the Mayor of London's air quality alert programme run by Imperial College London, which sends alerts to all schools, GP surgeries and care homes in LBRUT. Advice is based on Defra's national Daily Air Quality Index

Appendix A Details of Monitoring Site 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.

Each NO2 continuous analyser is automatically calibrated every night and also manually checked and calibrated by the contractor, TRL, employed by LBRuT for Local Support Officer (LSO) visits during 2022. Regular calibration visits of between 2-4 weeks were maintained throughout 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). Due to supply issues of special gases within the UK from Autumn onwards, overnight spans were not possible from October 2022. This was not resolved until Spring 2023.

The NO2 and ozone continuous analysers are 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.

Teddington (AURN) monitoring station at NPL is part of the AURN and AEA Technology manages the QA/QC for this station. For more information go to www.airquality.co.uk/archive/index.php (Defra, 2009d).

PM_{10} Monitoring Adjustment

PM10 particulates are measured using Tapered Element Oscillating Microbalance (TEOM) analysers, with the data presented as the gravimetric equivalent.

No automatic or fortnightly calibrations are carried out on TEOMs. 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 Imperial's LAQN QA/QC procedure, to ensure optimum data quality. Both sites are part of the LAQN and Imperial are responsible for the daily data collection, storage, validation and dissemination via the LAQN website (www.londonair.org.uk). Imperial ratifies the data periodically, viewing data over longer time periods and using the results from fortnightly checks, equipment services and equipment audits.

Measured mean PM_{10} concentration for both LBRuT's automatic monitoring sites for 2022 was 15ug/m3 for Castlenau and 14ug/m3 for Wetlands, achieving data capture rates of 90% and 98% respectively. Since this was above the Defra required 75% data capture threshold "annualisation" of data was not necessary. (This is in accordance with the procedure detailed in LLAQM Technical Guidance (TG19)).

A.2 Diffusion Tube - Quality Assurance / Quality Control

Directive 2008/50/EC of the European Parliament and of the Council on ambient air quality and cleaner air for Europe (EC, 2008), now adopted into UK law, 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 NO2 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 NO2 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 NO2 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/UK 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 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 – see Table 1 below:

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 ≤ ± 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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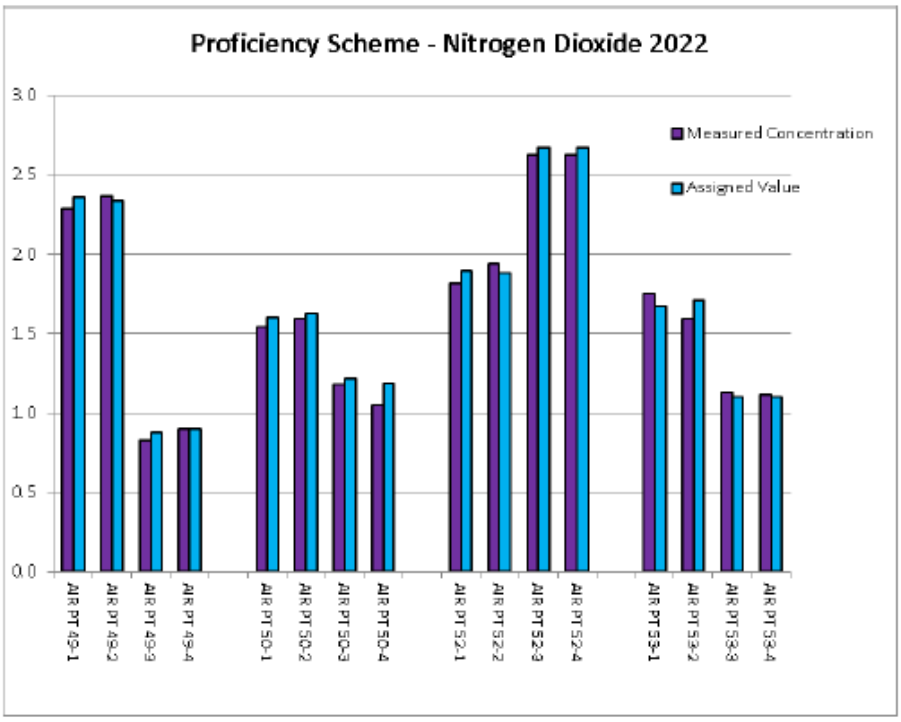
AIR PT Nitrogen Dioxide Proficiency Scheme Results 2022

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

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
Tayside Scientific Services	1	0	1	0	1	0
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

In 2022 therefore, the tube precision for NO2 Annual Field Inter-Comparison for Gradko International using the 50% TEA in acetone method was ‘good’ for the results of 14 participating local authorities and poor for 0 participating local authorities.

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**

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.

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
ATMOSPHERIC POLLUTANTS Collected on diffusion (sorbent) tubes and monitors	Chemical Tests	Documented In-House Methods
	Ammonia as ammonium (NH_4^+)	GLM 8 by Ion Chromatography
	Benzene Toluene Ethyl benzene Xylene	GLM 4 by Thermal Desorption/ FID Gas Chromatography
	Hydrogen chloride as chloride (Cl^-) Nitrogen dioxide as nitrite (NO_2^-) Sulphur dioxide as sulphate (SO_4^{2-}) Hydrogen fluoride as fluoride (F^-)	GLM 3 by Ion Chromatography
	Hydrogen sulphide	GLM 5 by Colorimetric determination (UV Spectrophotometry)
	Ozone as nitrate (NO_3^-)	GLM 2 by Ion Chromatography
	Nitrogen Dioxide as nitrite (NO_2^-)	GLM 7 by Colorimetric determination (UV Spectrophotometry)
	Sulphur dioxide as sulphate (SO_4^{2-})	GLM 1 by Ion Chromatography
	Formaldehyde as formaldehyde-DNPH	GLM 18 by HPLC
	Volatile Organic Compounds including: Benzene Toluene Ethylbenzene p-Xylene o-Xylene	GLM 13 by Thermal Desorption GC-Mass Spectrometry

UKAS TESTING 2187 Accredited to ISO/IEC 17025:2017	**Schedule of Accreditation** issued by **United Kingdom Accreditation Service** 2 Pine Trees, Chertsey Lane, Staines-upon-Thames, TW18 3HR, UK **Gradko International Ltd** **(Trading as Gradko Environmental)** **Issue No:** 025 **Issue date:** 19 December 2022
Testing performed at main address only	

Materials/Products tested	Type of test/Properties measured/Range of measurement	Standard specifications/ Equipment/Techniques used
ATMOSPHERIC POLLUTANTS Collected on diffusion (sorbent) tubes and monitors (cont'd)	Chemical Tests (cont'd)	
	Qualitative Analysis and Estimation of Volatile Organic Compounds on diffusion (sorbent) tubes and monitors	GLM 13 by Thermal Desorption GC-Mass Spectrometry with estimations in accordance with ISO standard 16000-6
	Naphthalene Tetrachloroethylene Trichloroethylene Styrene 1,2,4-Trimethylbenzene 1,3,5-Trimethylbenzene	GLM 13-1 by Thermal Desorption GC-Mass Spectrometry
	trans-1,2-Dichloroethene cis-1,2-Dichloroethene	GLM 13-3 by Thermal Desorption GC-Mass Spectrometry
	1,3-Butadiene	GLM 13-6 by Thermal Desorption GC-Mass Spectrometry
	Carbon Disulphide	GLM 13-7 by Thermal Desorption GC-Mass Spectrometry
	Vinyl Chloride	GLM 13-8 by Thermal Desorption GC-Mass Spectrometry
	Flexible scope for quantitative analysis of Volatile Organic Compounds on diffusion (sorbent) tubes and monitors in accordance with methods developed and validated by in-house procedure LWI 47	LWI 47 by Thermal Desorption GC-Mass Spectrometry
END		

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 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 Richmond 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 further absorption. The NO_2 diffusion tubes are labelled and kept refrigerated in plastic bags prior to and after exposure.

Factor from Local Co-location Studies

The local bias adjustment factors for the Borough are provided in Table L for 2016 to 2022. LBRUT, where possible, favour using a local roadside correction factor for kerbside/roadside sites and a background correction factor for background sites, so for ease of understanding, we are not providing bias adjustment factors for previous years in the body of the report. Please see table L.

In 2017, 2018 and 2022 the bias adjustment factor was the national bias adjustment factor for Gradko using the 50% TEA in acetone methodology. In 2016, 2020 and again in 2021 all kerbside and roadside sites in the Borough were bias adjusted using the factor from the local roadside co-location site at Richmond 1 Castelnau. In 2019, the bias adjustment factor was the average of the three static sites in the borough – the third was the Air Quality mobile, which was at the same roadside site for the duration of 2019. All background sites in the Borough for all years except 2020, 2021 and 2022 were bias adjusted using the factor from the local urban background co-location site at the Richmond 2 Barnes Wetlands. In 2020, 2021 and 2022, the National bias adjustment factor for Gradko (0.82 in 2020; 0.83 in 2021, 0.82 in 2022) was used for both background suites instead of Wetlands (0.83 in 2020; 0.82 in 2021) due to

poor data capture rate at Wetlands. Data capture at Wetlands (RI2) was 82% in 2020 and 85% in 2021 and 62% in 2022, below the 90% required.

The methodology for calculating the bias adjustment was followed using the guidance on the AEA spreadsheet.

Diffusion Tube Bias Adjustment Factors from Local Co-location Studies

In 2022, the Borough was unable to undertake co-location studies at it's two continuous NO_2 monitoring sites, with triplicate NO_2 diffusion tubes, due to poor data capture at the automatic monitoring sites. This is most regrettable. Unfortunately both sites experienced equipment failures which took both sites below the Defra threshold of 90% data capture. For more robust results, the national bias adjustment figure for Gradko 50% TEA/acetone has been used.

Discussion of Choice of Factor to Use

The National bias adjustment factor for Gradko using 50% TEA in acetone for March 2022 (v03/23) was **0.82.** Every year we consider which bias adjustment factor is best to use. In previous years, we have used Castelnau roadside site or the National bias adjustment factor for Gradko using 50% TEA in acetone or an average of all three LBRUT sites. In 2022, due to lower data capture rates of 80% at Castlenau and 62% at Wetlands(the threshold for Defra is 90 in TG(19) %) it was not possible to use local bias adjustment factors. We therefore used **the National bias adjustment factor** for Gradko which was **0.82** to bias adjust all sites - kerbside, roadside and background sites (see below).

Choice of bias adjustment factor is always given very careful consideration. Richmond has always achieved very good data capture rates over the last 20 years and have regularly used local results for the local area. Unfortunately due to various issues including equipment failure with the NOx/ NO_2 monitors during 2022, neither Castlenau nor Wetlands achieved the 90% data capture rate, required by Defra. This was most regrettable and meant we had no choice this year. From experience over many years, the results are likely to be slightly less conservative than local biased adjustment factors. We wish to neither under estimate nor over report levels of NO2 in the borough. We will be giving careful consideration to both the age and condition of equipment and the contractors who provide service and maintenance to the air quality monitoring stations over the coming year.

Table L. Bias Adjustment Factor

Year	Local or National	If Local, Version of National Spreadsheet	Adjustment Factor Roadside	Adjustment Factor Background
2022	National	Mar-23	0.82	0.82
2021	Local	Mar-22	0.87	0.83
2020	Local	Mar-21	0.91	0.83
2019	Local	Mar-20	0.9	0.99
2018	National	Mar-19	0.92	0.93
2017	National	Mar-18	0.97	1
2016	Local	Mar-17	0.98	1.08
2015	Local	Mar-16	0.92	1

A.3 Adjustments to the Ratified Monitoring Data

Short-term to Long-term Data Adjustment

For monitoring sites where data capture is less than 75% and greater than 25% of a full calendar year (between 3 and 9 months), the mean of the 'raw' concentrations has been "annualised" in accordance with Box 4.3 of the LLAQM Technical Guidance (TG19) before being compared to annual mean objectives. This was necessary at site 39 in 2022.

Wandsworth Town Hall was the closest continuous urban background site that fulfilled the criteria of TG19 plus the non-automatic diffusion tube background site 28 in Richmond Park. The continuous monitor is in London Borough of Wandsworth and recorded a data capture rate of 93% and Richmond Park recorded a data capture rate of 100% in 2022 - so greater than the 85% required. As two background sites were used the ratio of the Annual mean/Period mean were averaged and applied to the measured concentration of site 39. The full calculations are reproduced in the table M.

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

Start Date	End date	Wandsworth Town Hall (Urban Background) Continuous Monitor DC for 2022 = 93% (B1)	D1 (Diffusion Tube data, site 39)	B1 when D1 available	Annualised Concentration
05/01/2022	02/02/2022	40.5	52.93	40.5	
02/02/2022	02/03/2022	21.7			
02/03/2022	30/03/2022	35.2	40.44	35.2	
30/03/2022	05/05/2022	29.7			
05/05/2022	06/06/2022	21.8	31.16	21.8	
06/06/2022	06/07/2022	19.8	28.91	19.8	
06/07/2022	03/08/2022	22.7			
03/08/2022	31/08/2022	24.5	34.91	24.5	
31/08/2022	30/09/2022	29.6			
30/09/2022	02/11/2022	24.9	34.82	24.9	
02/11/2022	30/11/2022	25.6	39.15	25.6	
30/11/2022	03/01/2023	37.1	46.79	37.1	
Average		27.76	38.64	28.68	
Ratio(Ra)	Am/Pm (B1)			0.97	37.47

Start Date	End date	Richmond Park (DT 28) DC for 2022 = 100% (B2)	D1 (Diffusion Tube data, site 39)	B2 when D1 available	Annualised Concentration
05/01/2022	02/02/2022	22.04	52.93	22.04	
02/02/2022	02/03/2022	9.78			
02/03/2022	30/03/2022	20.93	40.44	20.93	
30/03/2022	05/05/2022	12.14			
05/05/2022	06/06/2022	9.20	31.16	9.2	
06/06/2022	06/07/2022	8.54	28.91	8.54	
06/07/2022	03/08/2022	9.06			
03/08/2022	31/08/2022	13.14	34.91	13.14	
31/08/2022	30/09/2022	14.52			
30/09/2022	02/11/2022	11.52	34.82	11.52	
02/11/2022	30/11/2022	12.17	39.15	12.17	
30/11/2022	03/01/2023	21.00	46.79	21	
Average		13.67	38.64	14.82	
Ratio(Ra)	Am/Pm (B2)			0.92	35.55

Average Ra correction factor	0.95
measured mean 2022	38.64
annualised mean ug/m3	36.71

NO_2 Fall off With Distance Calculations

Distance Adjustment

All NO2 diffusion tube results have been adjusted to represent exposure at the nearest façade. The concentration at the nearest receptor has been estimated using the LAQM NO2 Fall-off with Distance Calculator (Version 4.1) in line with the procedure detailed in LLAQM.TG (19).

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.

The monitored annual mean value has been bias adjusted and annualised where necessary and the background concentration is the annualised value for Wetlands, derived from the annualised mean of 4 x local background sites, all which achieved data capture rates above 85% for 2022 as per LLAQM (TG19) guidance.

Table N. NO_2 Fall off With Distance Calculations 2022

Monitored Annual Mean NO2 compared to exposure at nearest façade (□g m-3)

Site ID	Distance (m): Monitoring Site to Kerb	Distance (m): Receptor to Kerb	Background Concentration (µg m^{-3})	Monitored Concentration (Annualised and Bias Adjusted (µg m^{-3})	Concentration Predicted at Receptor (µg m^{-3})	Comment
1	1.7	1.9	14.0	22	21.8	
2	1.3	3.0	14.0	21	19.8	
4	0.8	2.5	14.0	24	21.8	
7	0.6	2.5	14.0	26	22.9	
9	0.8	6.3	14.0	23	19.4	
10	0.6	7.2	14.0	26	20.6	
11	0.6	9.1	14.0	24	19.0	
12	0.6	7.4	14.0	26	20.5	
13	0.8	6.3	14.0	24	20.0	
15	0.6	1.8	14.0	21	19.6	
17	0.9	2.0	14.0	31	28.3	
18	0.9	9.3	14.0	30	22.6	
19	0.7	16.0	14.0	21	16.9	
20	0.6	2.8	14.0	32	26.9	
22	0.5	4.2	14.0	17	15.9	
23	3.3	9.0	14.0	17	16.2	
25	2.3	2.5	14.0	29	28.7	
26	3.2	11.8	14.0	28	23.2	
27	1.9	6.8	14.0	18	16.8	
30	2.8	1.3	14.0	20	21.2	
31	1.0	6.4	14.0	31	24.6	
32	1.0	2.8	14.0	31	27.5	
33	3.3	6.9	14.0	28	25.3	
35	1.3	1.4	14.0	25	24.8	
36	2.1	2.2	14.0	**52**	**51.6**	
39	0.6	1.7	14.0	30	27.0	
40	1.0	11.4	14.0	24	19.1	
42	0.7	1.9	14.0	**41**	35.9	
43	0.7	1.6	14.0	39	35.1	
44	0.5	2.5	14.0	29	24.7	
45	0.5	2.7	14.0	20	18.2	

50	0.7	2.7	14.0	39	32.7	
51	2	2.1	14.0	19	18.9	
52	2	2.1	14.0	39	38.7	
54	0.6	1.3	14.0	26	24.3	
55	0.6	4.1	14.0	26	21.8	
56	1.0	9.6	14.0	23	18.9	
57	1.0	16.4	14.0	23	17.9	
58	0.7	6.4	14.0	25	20.4	
62	0.4	2.3	14.0	25	21.7	
63	1.8	3.2	14.0	30	27.9	
64	0.5	1.6	14.0	30	26.7	
65	0.5	2.7	14.0	33	27.3	
66	2.1	3.3	14.0	27	25.6	
67	1.4	2.7	14.0	21	20.0	
68	1.8	3.8	14.0	25	23.1	
69	2.0	2.9	14.0	20	19.5	
70	1.8	2.1	14.0	27	26.5	
71	2.9	9.9	14.0	34	27.7	
72	0.8	2.5	14.0	26	23.4	
73	2.1	8.4	14.0	28	23.4	
74	2.6	5.9	14.0	32	28.3	
75	0.6	6.3	14.0	25	20.3	
76	0.4	3.3	14.0	30	24.3	
77	0.6	4.5	14.0	31	24.7	
79	1	6.6	14.0	25	20.8	
80	0.8	2.6	14.0	24	21.7	
81	1.7	14.6	14.0	32	23.3	
82	2.5	4.8	14.0	21	19.9	
83	0.3	0.9	14.0	30	27.1	
Rut 01	2.9	3.0	14.0	24	23.9	
Rut 02	0.7	2.2	14.0	**43**	**36.8**	

Annualised mean of 4 x local back ground sites for The Wetland Centre 2022

Original Annual Mean	Annualisation Factor	Annualised Mean
14	1.016	14.2

Background Site	Annual Mean	Period Mean	Ratio
Windsor and Maidenhead - Aldebury Road	14.5	14	1.035
Reigate and Banstead - Horley South East	17.2	16.6	1.035
Southwark - Elephant and Castle	21.9	21.8	1.003
Wandsworth - Wandsworth Town Hall	27.8	28	0.992

Appendix B Full Monthly Diffusion Tube Results for 2022

Table O. NO_2 Diffusion Tube Results

Site ID	Valid data capture for monitoring period2022 %(b)	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	100	100	40.69	23.68	34.13	26.52	20.53	20.41	22.52	27.97	29.56	22.08	26.75	31.22	27	22
2	100	100	36.25	19.21	33.03	21.35	21.78	20.80	21.74	21.38	23.08	28.00	28.00	31.63	26	21
4	100	92	44.36	28.12		27.47	22.39	23.70	23.91	25.00	22.52	29.63	32.28	38.97	29	24
7	100	92	48.15	27.16	37.45		26.97	22.54	30.68	31.63	35.97	26.44	26.65	36.54	32	26
9	100	100	42.46	29.41	33.28	25.16	20.93	20.43	20.71	23.96	26.86	24.95	29.68	36.92	28	23
10	100	100	45.49	35.77	37.94	26.33	23.91	24.68	24.58	26.21	35.71	29.78	34.33	37.53	32	26
11	100	100	43.79	25.17	32.12	28.25	23.41	22.71	23.44	24.27	30.60	28.27	29.21	36.82	29	24
12	100	92	48.74	31.76		31.00	25.43	25.02	25.40	28.48	32.63	29.00	32.16	40.16	32	26
13	100	92	44.58	31.53	41.64	27.13	19.20	22.04	20.59	24.00	28.03	31.26	29.36		29	24
15	100	100	39.19	19.92	31.41	24.09	23.81	18.77	20.27	23.91	26.52	22.10	24.14	31.55	25	21
17	100	92	63.87	54.44	49.14		29.29	26.09	30.06	34.95	33.96	29.48	31.12	33.35	38	31
18	100	92	56.68	40.31	35.92	35.13	31.91	31.56	31.41	32.36	44.63	17.78		41.08	36	30
19	100	100	39.21	27.15	27.54	23.71	19.90	19.86	21.48	22.62	26.14	23.14	28.19	32.81	26	21
20	100	100	49.29	34.39	43.47	38.33	34.91	33.62	35.89	40.23	41.77	35.51	37.63	42.22	39	32
22	100	100	39.13	22.97	28.42	16.11	12.89	11.93	11.85	15.77	18.17	21.08	24.30	29.85	21	17
23	100	100	35.81	18.71	29.17	18.13	14.72	13.53	13.93	16.47	18.90	19.43	22.38	28.72	21	17
25	100	92	42.38	31.69	39.48	38.39		27.21	33.70	40.24	41.54	29.47	31.03	36.26	36	29
26	100	100	50.64	34.48	34.22	31.85	29.79	24.48	28.97	28.19	37.15	31.59	34.16	37.76	34	28

27	100	100	34.24	22.34	26.80	20.35	19.56	18.35	17.73	20.82	22.41	20.45	20.76	26.28	23	18
28	100	100	22.04	9.78	20.93	12.14	9.20	8.54	9.06	13.14	14.52	11.52	12.17	21.00	14	11
30	100	100	39.04	19.82	32.59	24.60	18.04	17.05	18.59	21.69	23.93	20.69	25.60	29.89	24	20
31	100	100	54.51	32.17	45.10	34.25	32.99	27.58	30.44	34.75	40.58	39.44	45.92	42.31	38	31
32	100	92	56.08	42.32		37.98	33.85	31.46	33.71	39.25	34.17	35.10	41.51	35.47	38	31
33	100	92	53.21	30.87	40.07		31.47	27.77	31.91	33.11	36.89	25.64	29.45	32.97	34	28
35	100	100	48.04	33.32	34.15	22.59	22.07	24.83	26.22	23.61	30.56	28.33	35.82	37.33	**31**	**25**
36	100	100	70.01	61.18	61.76	48.30	60.53	61.73	62.56	66.26	71.49	68.14	67.24	55.40	**63**	**52**
37	100	100	27.92	14.14	26.79	15.10	11.43	10.16	10.95	13.59	15.14	15.71	18.45	23.49	17	14
39	100	67	52.93		40.44		31.16	28.91		34.91		34.82	39.15	46.79	37	30
40	100	92	47.32	30.90	34.40	25.91	27.01	23.15	24.31	25.68		24.25	29.91	33.94	30	24
42	100	92	57.62	55.50	52.28		46.81	45.10	50.24	48.29	50.80	50.14	52.25	47.59	**51**	**41**
43	100	83	63.07		49.59		41.03	39.98	44.22	43.91	46.71	47.08	48.30	47.38	**47**	39
44	100	92		36.49	42.86	28.49	32.12	27.60	33.47	32.82	41.97	32.82	36.27	37.91	35	29
45	100	92		29.31	33.29	17.87	19.72	19.48	20.98	21.95	24.43	25.28	25.93	30.97	24	20
50	100	100	55.89	43.92	53.04	45.28	45.63	45.35	46.04	48.34	50.79	47.11	44.21	46.93	**48**	39
51	100	100	36.78	22.46	27.85	17.04	17.95	16.42	17.34	19.61	22.85	23.74	23.44	32.53	23	19
52	100	100	57.19	47.05	42.32	42.07	46.40	45.05	50.14	45.34	49.10	43.17	48.32	48.46	**47**	39
54	100	100	44.46	30.58	34.28	27.98	27.35	22.95	29.42	31.67	33.59	31.39	34.44	39.17	32	26
55	100	100	42.39	24.46	34.93	31.24	25.51	24.67	30.34	33.24	34.12	30.78	31.06	36.09	32	26
56	100	100	42.73	26.73	30.41	30.28	23.75	18.77	26.51	25.80	26.88	25.83	28.25	31.64	28	23
57	100	92		28.26	35.19	25.41	24.10	22.00	22.88	28.06	32.39	22.12	31.60	38.40	28	23
58	100	100	44.45	30.23	35.97	24.85	26.51	23.41	23.62	26.45	28.61	27.83	33.54	36.11	30	25
62	100	100	43.96	27.60	37.02	29.91	27.33	23.07	24.57	28.93	30.01	25.43	29.80	34.69	30	25
63	100	92	38.58	28.36	36.64		29.32	28.04	30.72	25.49	34.39	32.81	36.46	78.03	32	26

64	**100**	**100**	**54.36**	**33.16**	**34.47**	**35.87**	**31.97**	**30.43**	**33.53**	**34.93**	**36.12**	**38.67**	**38.05**	**43.93**	37	30
65	**100**	**92**	**58.95**	**44.92**	**46.82**	**33.66**	**32.66**	**35.21**		**35.37**	**39.86**	**38.37**	**37.60**	**42.73**	**41**	33
66	**100**	**100**	**46.38**	**34.15**	**37.02**	**28.11**	**28.43**	**28.44**	**29.63**	**27.92**	**34.17**	**32.14**	**32.70**	**41.06**	33	27
67	**100**	**92**	**41.24**	**19.19**	**33.48**	**20.45**	**21.65**	**18.46**		**21.95**	**26.62**	**20.06**	**29.04**	**34.83**	26	21
68	**100**	**100**	**45.80**	**32.81**	**33.62**	**25.93**	**27.56**	**23.60**	**23.64**	**25.99**	**29.78**	**30.26**	**32.19**	**33.56**	30	25
69	**100**	**92**	**37.22**	**20.30**	**35.43**	**24.65**		**22:31**	**18.15**	**21.89**	**21.10**	**23.94**	**29.29**	**34.14**	24	20
70	**100**	**75**	**46.87**	**28.48**		**22.42**	**27.73**			**28.60**	**33.31**	**31.33**	**39.16**	**35.83**	33	27
71	**100**	**100**	**49.07**	**31.03**	**47.03**	**37.49**	**38.88**	**39.68**	**41.17**	**42.16**	**40.18**	**40.34**	**43.56**	**40.29**	**41**	34
72	**100**	**100**	**47.19**	**28.90**	**38.13**	**21.60**	**23.14**	**25.19**	**25.39**	**25.37**	**33.41**	**28.85**	**39.17**	**38.37**	31	26
73	**100**	**92**	**56.07**	**32.21**		**28.04**	**24.98**	**30.01**	**29.25**	**26.39**	**35.82**	**35.86**	**39.26**	**41.39**	34	28
74	**100**	**100**	**54.89**	**36.43**	**47.65**	**33.16**	**32.40**	**32.64**	**34.12**	**38.43**	**38.71**	**40.15**	**39.90**	**41.57**	39	32
75	**100**	**92**	**42.45**	**31.91**		**29.43**	**23.13**	**23.42**	**26.63**	**25.55**	**32.08**	**29.55**	**33.20**	**36.03**	30	25
76	**100**	**100**	**49.19**	**30.52**	**46.54**	**33.25**	**31.56**	**32.29**	**34.41**	**34.31**	**34.48**	**33.29**	**40.85**	**39.25**	37	30
77	**100**	**100**	**55.10**	**35.31**	**51.48**	**34.24**	**33.13**	**25.69**	**32.24**	**33.34**	**36.75**	**35.86**	**40.40**	**37.51**	38	31
79	**100**	**100**	**49.40**	**27.88**	**37.23**	**31.29**	**24.91**	**23.20**	**27.32**	**27.81**	**29.96**	**25.79**	**27.28**	**34.40**	31	25
80	**100**	**100**	**43.11**	**24.20**	**36.87**	**22.17**	**23.63**	**20.27**	**21.42**	**26.03**	**29.42**	**29.11**	**33.49**	**36.45**	29	24
81	**100**	**100**	**44.67**	**41.32**	**40.11**	**36.60**	**34.61**	**31.67**	**37.34**	**39.21**	**40.45**	**38.80**	**41.11**	**39.84**	39	32
82	**100**	**92**		**24.87**	**38.06**	**24.37**	**21.40**	**18.06**	**21.80**	**24.53**	**29.62**	**23.77**	**27.38**	**31.17**	26	21
83	**100**	**100**	**58.94**	**30.95**	**43.45**	**35.43**	**28.96**	**27.54**	**32.91**	**36.90**	**38.63**	**26.73**	**35.76**	**43.47**	37	30
Rut 01	**100**	**100**	**43.66**	**33.45**	**33.93**	**26.59**	**23.35**	**23.05**	**23.76**	**25.40**	**26.66**	**28.22**	**31.77**	**30.40**	29	24
Rut 02	**100**	**92**	**72.82**	**54.44**	**49.00**	**46.66**		**51.64**	**54.54**	**50.17**	**49.08**	**44.25**	**41.95**	**55.98**	**52**	**43**

For Triplicate sites see below.

Triplicate NO2 diffusion tube results for sites 23 and 37 in ug/m3

Site Code	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
23	37.09	18.88	29.81		15.33	13.57	13.92	16.02	19.64	19.40	23.68	29.02
23/2	37.15	18.39	28.38	17.95	14.81	13.63	13.88	16.29	18.27	21.39	23.13	28.65
23/3	33.18	18.86	29.30	18.31	14.02	13.39	13.98	17.10	18.78	17.50	20.32	28.49
Average	35.81	18.71	29.17	18.13	14.72	13.53	13.93	16.47	18.90	19.43	22.38	28.72
37	28.11	13.68	29.04	15.45	12.19	10.56	11.17	14.24	15.18	15.18	18.28	23.68
37/2	27.74	14.29	27.42	14.78	10.22	9.89	10.91	13.30	15.46	16.37	18.85	23.13
37/3	27.92	14.46	23.93	15.06	11.89	10.03	10.78	13.24	14.79	15.58	18.24	23.68
Average	27.92	14.14	26.79	15.10	11.43	10.16	10.95	13.59	15.14	15.71	18.45	23.49

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 33%.

(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 C

Air Quality Monitoring Programme for state schools in LBRuT 2022 – 2024

Richmond Air Quality team committed to monitoring air quality at 12 monitoring sites per annum in Primary Schools in the Air Quality Action Plan 2020 - 2025.

Following various enquiries and requests from residents, parents and Councillors in 2021, the team decided to increase this target – both the duration and the number of schools. It will now provide 12 monitors (one monitor a month for 12 months) for each state primary school in the borough and include state nursery and senior schools.

From the beginning of January 2022, LBRuT commenced a 3-year programme to monitor 24/7 for a full year, as close as possible to the main school gate or worst-case scenario for each school. This will give robust data on air quality for all state schools within the borough.

In 2022, the Council monitored at 14 x Primary Schools and 1 x Nursery School. This is in addition to the 10 x schools monitored as part of the permanent monitoring schedule or part of additional proposed road schemes. All results for the schools monitored in 2022 are below.

NO2 falls off quickly with distance from source, largely road traffic in this borough, so levels within the school playground and within buildings set back from the road, sometimes with a barrier, will be slightly lower than those recorded outside on the pavement. The results below indicate that levels within all 25 schools monitored in 2022 are within UK limit values for NO2.

However, parents should be mindful of the route they walk to school as many pupils are exposed to higher levels of air pollution during the walk to/from school, some at peak hours, than those experienced at school during the student day. Levels inside vehicles may be higher still.

Please note NO2 (nitrogen dioxide) has been monitored 24/7 by passive diffusion tube, an accepted and accredited means of monitoring NO2 and used borough wide, comparable to results within this report. A similar device does not exist for PM (particulate matter). To get an idea of levels, officers used a hand held MET One Aerocet 831 for PM10 and PM2.5 measurements. These measurements are spot check readings on the day. Conditions, which may influence readings, are noted at the bottom of the charts.

AQ monitoring for LBRUT Primary/Nursery Schools		NO_2 (ug/m3)														Gradko
		2022														0.82
Site ID	School	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total	Annual mean	Bias adjusted
Sch 01	Darell Primary Sch, Darell Rd, Richmond, TW9	33.24	20.26	29.13	16.35	15.40	13.22	13.93	15.82	20.03	20.47	20.51	29.49	247.85	21	17
Sch 02	Holy Trinity C of E Sch, Carrington Rd, Richmond, TW10	27.41	15.28	25.27	13.82	14.58	11.46	12.78	15.25	16.80	17.58	16.30	24.87	211.41	18	14
Sch 03	St. Mary Magdelens Primary Sch, Worple Street,SW14	28.08	17.12	28.24	14.69	13.23	11.73	12.05	15.04	16.90	18.21	20.63	25.66	221.59	18	15
Sch 04	Windham Nursery School, Windham Rd, Richmond, TW9	30.46	17.94	25.98	15.86	12.93	11.11	12.70	14.92	17.22	18.33	21.51	27.26	226.22	19	15
Sch 05	Barnes Primary Schl, Cross St, Barnes, SW13 0Q	32.18	17.42	29.65	18.20	13.30	12.28	13.44	12.97	18.38	17.17	17.06	27.53	229.57	19	16
Sch 06	Carlisle Primary Sch Broad Lane, Hampton, TW12	30.01	14.40	26.71	15.03	12.59	11.92	13.35	15.25	17.20	16.23	19.82	28.80	221.31	18	15
Sch 07	St. Marys C of E Sch, Amyand Pk Rd, Twickenham, TW1	37.52	21.08	30.12	16.68	16.85	17.57	missing	20.49	24.57	23.04	23.85	27.86	259.62	24	19
Sch 08	St. Marys Infant Sch, 100 Richmond Rd, Twickenham, TW1	38.70	26.53	34.39	28.30	20.07	18.38	22.09	20.9	25.73	25.52	26.52	33.99	321.12	27	22
Sch 09	St. Osmunds Rc Primary Sch, Church Rd, SW13	38.57	26.20	35.53	20.46	17.94	18.07	16.63	18.78	21.22	23.53	26.44	33.00	296.37	25	20
Sch 10	Marshgate Primary Sch, 157 Queens Rd, Richmond, TW10	45.95	27.86	55.00	31.38	32.05	26.85	35.27	34.04	39.68	33.26	35.30	39.14	435.77	36	30
Sch 11	Turing House Sch,Hospital Bridge Rd, TW2	37.41	21.48	29.96	22.68	16.04	16.31	17.66	18.85	24.93	23.76	24.17	28.69	281.93	23	19
Sch 12	Nelson Primary Sch, Nelson Rd, TW2	34.73	24.53	34.34	22.92	16.58	16.36	16.49	18.09	22.12	24.52	24.54	31.14	286.38	24	20
Sch 13	Priest Bridge Primary Sch, Hospital Bridge Rd, TW2	37.86	21.34	missing	18.36	16.88	16.06	17.44	19.33	24.32	26.34	27.50	31.21	256.64	23	19
Sch 14	Meadlands Primary Sch, Broughton Ave, Ham, TW10	36.33	15.26	22.89	12.76	12.07	9.68	10.95	12.3	14.51	13.85	15.50	24.27	200.37	17	14
Sch 15	St Richards Cof E Prim Sch, Ashburnham Rd, Ham, TW10	34.87	13.25	23.69	12.53	10.73	missin	11.17	13.01	15.39	15.23	15.59	25.58	191.03	17	14
105	East Sheen Primary Sch, URRW, SW14	51.02	40.85	53.37	40.71	42.67	45.57	48.08	45.56	44.78	39.64	39.14	39.61	530.98	44	36
71	St Stephens Primary Sch, Winchester Rd, TW1	47.19	31.03	47.03	37.49	38.88	39.68	41.17	42.16	40.18	40.34	43.56	40.29	488.99	41	33
20	Queens RC Primary Sch, Cumberland Rd, TW9	49.29	34.39	43.47	38.33	34.91	33.62	35.89	40.23	41.77	35.51	37.63	42.22	467.26	39	32
27	St Elizabeth's RC Primary Sch, Queens Rd, TW10	34.24	22.34	26.80	20.35	19.56	18.35	17.73	20.82	22.41	20.45	20.76	26.28	270.10	23	18
30	The Russell School, Petersham Rd, TW10	39.04	19.82	32.59	24.60	18.04	17.05	18.59	21.69	23.93	20.69	25.60	29.89	291.52	24	20
215	Hampton Hill Jnr Schl, St James Ave, TW12	30.54	14.30	22.88	14.99	10.70	9.90	9.90	13.15	17.20	16.21	18.06	24.16	201.98	17	14
242	Kew Day Nursery + Pre-sch, Townmead Rd, TW9	34.38	19.08	23.10	15.51	13.33	14.22	15.19	16.80	20.48	19.45	23.50	13.94	228.99	19	16
ES 02	Tower House, Sheen Lane, SW14	30.71	18.69	missing	18.67	13.35	12.05	14.51	17.01	20.24	18.24	20.81	29.22	213.50	19	16
ES 03	Sheen Mount, West Temple Sheen, SW14	28.45	14.66	23.93	14.90	11.24	9.54	10.66	12.71	16.53	15.00	15.06	24.87	197.55	16	13
ES 09	Richmond Park Academy, Hertford Avenue, SW14	26.56	13.80	21.66	13.41	10.88	10.91	11.59	14.34	16.60	13.17	15.63	22.40	190.95	16	13

UK annual limit value: NO2 = 40 ug/m3. All monitoring sites are as close as possible to the main school gates or worse case scenario for school exposure

Key:

	0-40 µg/m³ (complies with EU/UK annual NO2 limit value)
	40-60 µg/m³ (exceeds EU/UK annual NO2 limit value)
	over 60 µg/m³ (exceeds EU/UK annual NO2, likely exceeds EU/UK hourly NO2 limit value)

AQ hot spot PM 10 monitoring for LBRUT		PM_{10} (ug/m^3)											
Primary/Nursery Schools		2022											
Site ID	School	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Sch 01	Darell Primary Sch, Darell Rd, Richmond, TW9	9.5	4.5	10.4	9.6	25.8	3.8	6.9	9.7*	7.9	20.6	8.9	26.2
Sch 02	Holy Trinity C of E Sch, Carrington Rd, Richmond, TW10	10.9	7.3	9.6	11.8	19.9	6.3	4.2	8.4	11.8*	6	13.1	21.2
Sch 03	St. Mary Magdelens Primary Sch, Worple Street,SW14	6.6	3.7	5.5	6.5	24.9	5.3	6.4	7.7	9.6	15.8	18.7	26.6
Sch 04	Windham Nursery School, Windham Rd, Richmond, TW9	9.7	5.1	8.1	11.3	18.5	3.8	4.9	9.4*	9.1	19.1	9.6	27.4
Sch 05	Barnes Primary Schl, Cross St, Barnes, SW13 0Q	8	5.1	6.3	6.4	20.8	7.5	7.6	7.8	8.2	17.9	19.6	30.5
Sch 06	Carlisle Primary Sch Broad Lane, Hampton, TW12	16.8	15.8	15.5	16.2	16.3	12.3	3.4	7.3	15.3*	12.7	17.6	30.1
Sch 07	St. Marys C of E Sch, Amyand Pk Rd, Twickenham, TW1	18.7	14.3	12.1	14.2	22.4	18.2	6.1	7.5	19.5*	14.6	18.1	35.8
Sch 08	St. Marys Infant Sch, 100 Richmond Rd, Twickenham, TW1	17.4	14.4	12.9	15	24.7	23.8	5.1	9.1	17.8*	16.6	18.5	37.6
Sch 09	St. Osmunds Rc Primary Sch, Church Rd, SW13	18.4	16.7	12.6	16.6	22	7.5	5.3	7.5	11.4	14.9	22.1	37.1
Sch 10	Marshgate Primary Sch, 157 Queens Rd, Richmond, TW10	18.3	7.8	8.8	14.1	19.5	6.9	6.1	8.8	13.4	8	17.8	25.9
Sch 11	Turing House Sch,Hospital Bridge Rd, TW2	25.1	23.8	14.8	20.2	19.2	12.8	6.9	7.3	23.6*	11.9	16.9	25.8
Sch 12	Nelson Primary Sch, Nelson Rd, TW2	19.3	11.6	12.2	16.3	18.7	15.3	4.8	7.6	11.3*	11.3	14.7	24.0
Sch 13	Priest Bridge Primary Sch, Hospital Bridge Rd, TW2	22	17.4	14.6	17.7	18.7	10.9	2.5	6.7	18.1*	12.1	17.4	26.9
Sch 14	Meadlands Primary Sch, Broughton Ave, Ham, TW10	18.5	10.8	18.6	14.4	16.7	7.6	5.3	4.7	11.9*	7.5	7.3	23.3
Sch 15	St Richards Cof E Prim Sch, Ashburnham Rd, Ham, TW10	17.3	17	18.3	15.6	17.3	6.2	5.1	5.3	12.2*	7.4	9.4	25.1
105	East Sheen Primary Sch, URRW, SW14	23.4	19.6	20	21.6	25.6	23.6	9	11.6	9	19.8	17.6	32.2
71	St Stephens Primary Sch, Winchester Rd, TW1	24.3	19.8	20.1	21.8	25.6	22.8	7.8	8.6	8.6	14.5	16.9	31.4
20	Queens RC Primary Sch, Cumberland Rd, TW9	22.7	18.9	17.4	19.4	24.2	20.7	7.3	8.1	8.4	14.8	17.2	28.6
27	St Elizabeth's RC Primary Sch, Queens Rd, TW10	18.3	14.5	17.2	9.9	20.8	18.8	5.7	7.2	8.1	13.2	14.3	24.3
30	The Russell School, Petersham Rd, TW10	17.2	8.9	19.1	10.8	16.6	14.2	6	5.7	6.8	7.1	7.1	27.1
215	Hampton Hill Jnr Schl, St James Ave, TW12	15.1	7	18.7	8.3	15.7	13.8	2.8	7	19.9*	10.8	15.8	27.9
242	Kew Day Nursery + Pre-sch, Townmead Rd, TW9	12.8	6.9	14.3	8.3	16.2	13.9	3.9	6.6	8.6	12.7	12.1	18.9
ES 02	Tower House, Sheen Lane, SW14	8.9*	6.5*	5.9*	7.1*	18.2*	4.8*	6.3*	8.0*	8.9*	15.9*	18.8	29.2
ES 03	Sheen Mount, West Temple Sheen, SW14	9	6.5	8.5	7.6	17.5	4.4	9.3	9.9	11.8	10.6	17.7	31.8
ES 09	Richmond Park Academy, Hertford Avenue, SW14	5.9	5.1	6.7	7	20.8	6.3	5.8	7.3	12.3	15.1	20.9	24.6
UK annual limit value : PM10 = 40ug/m3													

Notes
Tarmacing road
30/11/22 - 1/12/22 - pollution episode
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AQ hot spot PM 2.5 monitoring for LBRUT		$PM_{2.5}$ (ug/m^3)											
Primary/Nursery Schools		2022											
Site ID	School	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Sch 01	Darell Primary Sch, Darell Rd, Richmond, TW9	4	2	3.9	5	12	1.9	1.5	2.7*	2.3	7.2	3.8	15.7
Sch 02	Holy Trinity C of E Sch, Carrington Rd, Richmond, TW10	4.8	3.5	5.5	5.2	11.1	1.9	1.5	2.4	3.6*	2.5	5.7	13.4
Sch 03	St. Mary Magdelens Primary Sch, Worple Street,SW14	3	1.9	3.6	3.5	17.5	1.9	2.3	2.2	2.8	5.5	8.6	18
Sch 04	Windham Nursery School, Windham Rd, Richmond, TW9	4.7	2.3	4.8	3.9	11.9	1.6	1.4	2.6*	2.5	6.6	4.6	19.2
Sch 05	Barnes Primary Schl, Cross St, Barnes, SW13 0Q	4.8	2.3	3.8	4.2	16.1	2.1	2.2	2.5	2.7	6.9	8.2	20.6
Sch 06	Carlisle Primary Sch Broad Lane, Hampton, TW12	6.4	3.7	6.4	6.8	12.8	5.5	0.7	2.3	4.2*	6.3	5.5	20.8
Sch 07	St. Marys C of E Sch, Amyand Pk Rd, Twickenham, TW1	8.4	7.8	9.1	6.9	12.7	5.8	1.2	2.6	4.1*	8.1	6.6	23.7
Sch 08	St. Marys Infant Sch, 100 Richmond Rd, Twickenham, TW1	6.7	7.6	8.6	7.1	12.8	8.1	1.8	3.1	3.9*	9.3	7.6	24.2
Sch 09	St. Osmunds Rc Primary Sch, Church Rd, SW13	5.4	3.9	7.6	6.7	15.2	2.3	2.1	2.8	3.2	7	7	22.6
Sch 10	Marshgate Primary Sch, 157 Queens Rd, Richmond, TW10	7.9	3.3	6.5	7.7	11.2	2.9	1.6	2.6	3.6	3.1	7.3	11.7
Sch 11	Turing House Sch,Hospital Bridge Rd, TW2	10.2	8.3	10.2	9.4	12.6	5.5	0.7	2.3	4.2*	5.7	4.3	16.7
Sch 12	Nelson Primary Sch, Nelson Rd, TW2	8.9	7.6	8.9	8.8	12.5	5.5	0.6	2.1	3.4*	5.7	4.7	15.3
Sch 13	Priest Bridge Primary Sch, Hospital Bridge Rd, TW2	10.1	8.1	9.5	9	12.9	5.5	0.5	2.3	5.2*	6	4.6	17.1
Sch 14	Meadlands Primary Sch, Broughton Ave, Ham, TW10	7.6	5.3	8	7.7	12.5	1	1.2	1.5	3.1*	3.4	3	14.4
Sch 15	St Richards Cof E Prim Sch, Ashburnham Rd, Ham, TW10	6.6	5	7.7	7.4	12.1	2.4	1.3	1.6	2.6*	2.8	3.5	14.9
105	East Sheen Primary Sch, URRW, SW14	14	13.9	14.2	10.2	15.6	8.8	4	3.1*	4	6.6	6.7	18.6
71	St Stephens Primary Sch, Winchester Rd, TW1	14.7	14.5	14.9	10.4	15.6	8.2	3.6	2.1	3.4	6.2	5.8	19.2
20	Queens RC Primary Sch, Cumberland Rd, TW9	13.2	12.7	12.8	8.9	15.4	5.5	3.5	2	2.8	6.1	6.3	17.6
27	St Elizabeth's RC Primary Sch, Queens Rd, TW10	9.8	9.6	10.5	6.3	13.7	4.9	2.2	1.7	2.7	5.8	4.9	17.2
30	The Russell School, Petersham Rd, TW10	7.2	4.4	7	4.1	12.3	4.8	1.8	1.7	1.9	3.1	3.1	19.6
215	Hampton Hill Jnr Schl, St James Ave, TW12	6.3	4.1	6	3.8	12.2	5.9	0.7	2.4	3.6*	3.8	9.5	19.6
242	Kew Day Nursery + Pre-sch, Townmead Rd, TW9	6.2	4.2	6.1	4.8	12.1	4.6	0.8	1.6	2.1	3.9	3.5	11.7
ES 02	Tower House, Sheen Lane, SW14	4.2*	2.7*	4.6*	3.2*	11.6*	1.5*	2.0*	2.6*	3.9*	6.2*	8.4	19.1
ES 03	Sheen Mount, West Temple Sheen, SW14	4.4	3.1	4.9	3.4	11.7	1.3	1.8	2.4	43.7	4.1	7.5	21.5
ES 09	Richmond Park Academy, Hertford Avenue, SW14	2.4	2.2	4.7	3.1	11.3	1.6	1.8	2.1	3.9	6.1	9.4	16.7
UK annual limit value : PM2.5 = 20ug/m3													

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