

London Borough of Richmond upon Thames Air Quality Annual Status Report for 2023

Date of publication: 4th June 2024



This report provides a detailed overview of air quality in the London Borough of Richmond upon Thames during 2023. It has been produced to meet the requirements of the London Local Air Quality Management statutory process¹.

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 2024 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 PM₁₀). 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. 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.

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Abbreviations

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

Table A. Summary of National Air Quality and International Standards, Objectives and Guidelines

| Pollutant | Standard / Objective / Guideline | Averaging Period | Date ⁽¹⁾ |
|-------------------------------------|--|------------------|-----------------------|
| Nitrogen dioxide (NO ₂) | 200 µg m ⁻³ not to be exceeded more than 18 times a year | 1-hour mean | 31 Dec 2005 |
| Nitrogen dioxide (NO ₂) | 40 µg m ⁻³ | Annual mean | 31 Dec 2005 |
| Nitrogen dioxide (NO ₂) | WHO AQG ⁽²⁾ : 10 µg m ⁻³ | Annual mean | |
| Particles (PM ₁₀) | 50 µg m ⁻³ not to be exceeded more than 35 times a year | 24-hour mean | 31 Dec 2004 |
| Particles (PM ₁₀) | WHO AQG ⁽²⁾ : 45 µg m ⁻³ not to be exceeded more than 3-4 times a year | 24-hour mean | |
| Particles (PM ₁₀) | 40 µg m ⁻³ | Annual mean | 31 Dec 2004 |
| Particles (PM ₁₀) | WHO AQG ⁽²⁾ : 15 µg m ⁻³ | Annual mean | |
| Particles (PM _{2.5}) | 20 µg m ⁻³ | Annual mean | 2020 |
| Particles (PM _{2.5}) | London Mayoral Objective ⁽³⁾ : 10 µg m ⁻³ | Annual mean | 2030 |
| Particles (PM _{2.5}) | WHO AQG ⁽²⁾ : 5 µg m ⁻³ | Annual mean | |
| Particles (PM _{2.5}) | Target of 15% reduction in concentration at urban background locations | 3-year mean | Between 2010 and 2021 |
| Particles (PM _{2.5}) | WHO AQG ⁽²⁾ : 15 µg m ⁻³ | 24-hour mean | |
| Sulphur dioxide (SO ₂) | 266 µg m ⁻³ not to be exceeded more than 35 times a year | 15-minute mean | 31 Dec 2005 |
| Sulphur dioxide (SO ₂) | 350 µg m ⁻³ not to be exceeded more than 24 times a year | 1-hour mean | 31 Dec 2004 |
| Sulphur dioxide (SO ₂) | 125 µg m ⁻³ not to be exceeded more than 3 times a year | 24-hour mean | 31 Dec 2004 |
| Sulphur dioxide (SO ₂) | WHO AQG ⁽²⁾ : 40 µg m ⁻³ not to be exceeded more than 3-4 times a year | 24-hour mean | |

Notes:

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

(2) 2021 World Health Organisation Air Quality Guidelines

(3) London Mayoral Objective

1. Air Quality Monitoring

The latest monitoring results for 2023 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. To clarify, the borough-wide AQMA has declared exceedences of the annual mean objective for NO₂ and for exceedence of the annual and 24-hour mean objectives for PM₁₀ (i.e. the AQMA covers both long-term and short-term PM₁₀ objectives). LBRUT also recognise the need for stricter objectives following changes to the World Health Organisation Guidelines on key pollutants announced on the 22nd September 2021.

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

- NO₂
- PM₁₀
- Ozone (O₃)
- PM_{2.5}

The Council previously monitored SO₂ (ceased in April 2011), CO (ceased in April 2012), and Benzene (ceased in January 2012), these 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 real time measurements of pollution levels, but is expensive, so using them for a large coverage of LBRuT would be 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).

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 four 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 <https://www.londonair.org.uk/LondonAir/Default.aspx>

Table B. Details of Automatic Monitoring Sites for 2023

| Site ID | Site Name | Site Type | X OS Grid Ref (Easting) | Y OS Grid Ref (Northing) | Pollutants Monitored | In AQMA? Which AQMA? | Distance to Relevant Exposure (m) | Distance to Kerb of Nearest Road (m) | Tube Co-located with a Continuous Analyser | Height (m) |
|---------|---------------------------|-----------|-------------------------|--------------------------|----------------------|----------------------|-----------------------------------|---|--|------------|
| RI1 | Castelnau Library, Barnes | Roadside | 522500 | 177166 | NO2, PM10 | LBRuT | Chemiluminescent; TEOM | 8m | 3.3m | 2.35m |
| RI2 | Wetlands Centre, Barnes | Suburban | 522993 | 176731 | NO2, PM10,O3 | LBRuT | Chemiluminescent; TEOM | 10m - Children in adjacent play area/people attending Wetlands Centre | 1160m | 3.2m |

Notes:

- (1) 0m if the monitoring site is at a location of exposure (e.g. installed on the façade of a residential property).
- (2) N/A if not applicable

Table 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 65 permanent diffusion tube sites across the Borough in 2023. 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 2023

| Diffusion Tube ID | Site Name | Site Type | X OS Grid Ref (Easting) | Y OS Grid Ref (Northing) | Pollutants Monitored | In AQMA? Which AQMA? | Distance to Relevant Exposure (m) | Distance to Kerb of Nearest Road (m) | Tube Co-located with a Continuous Analyser | Height (m) |
|-------------------|---|-----------|-------------------------|--------------------------|----------------------|----------------------|-----------------------------------|--------------------------------------|--|------------|
| 1 | Hampton Court Rd, Hampton (nr Bushy Pk gates) | Roadside | 515824 | 168815 | NO ₂ | LBRuT | 1.9 | 1.7 | No | 2.2 |
| 2 | Percy Rd, Hampton (nr. level crossing/Waitrose) | Roadside | 513217 | 169746 | NO ₂ | LBRuT | 3.0 | 1.3 | No | 2.2 |
| 4 | Hampton Rd, Hampton Hill (nr. Laurel Dene) | Kerbside | 514607 | 171258 | NO ₂ | LBRuT | 9.8 | 0.6 | No | 2.2 |
| 7 | Broad St, Teddington (o/s Boots) | Kerbside | 515695 | 170983 | NO ₂ | LBRuT | 2.5 | 0.8 | No | 2.2 |

| | | | | | | | | | | |
|---------------------------|--|----------|--------|--------|-----|-------|------|-----|-----|-----|
| 9 | Hampton Rd, Twickenham (nr Fifth Cross Rd) | Kerbside | 514846 | 172348 | NO2 | LBRuT | 2.0 | 0.6 | No | 2.2 |
| 10 | Twickenham Rd, Twickenham (opp. Fulwell golf course) | Kerbside | 513390 | 172233 | NO2 | LBRuT | 7.2 | 0.6 | No | 2.2 |
| 11 | Percy Rd, Whitton (nr. Percy Way) | Kerbside | 514136 | 173389 | NO2 | LBRuT | 9.1 | 0.6 | No | 2.2 |
| 12 | Hanworth Rd, Whitton (nr Lyndhurst Ave) | Kerbside | 512612 | 173439 | NO2 | LBRuT | 7.4 | 0.6 | No | 2.2 |
| 13 | Whitton Rd, Whitton, (opp. rugby ground) | Kerbside | 515228 | 174082 | NO2 | LBRuT | 6.3 | 0.8 | No | 2.2 |
| 15 | Richmond Rd, Twickenham (opp. Marble Hill Pk) | Kerbside | 517196 | 173933 | NO2 | LBRuT | 1.8 | 0.6 | No | 2.2 |
| 17 | Red Lion Street, Richmond | Kerbside | 517822 | 174755 | NO2 | LBRuT | 2.0 | 1.2 | No | 2.2 |
| 18 | Lower Mortlake Rd, Richmond (nr Trinity Rd) | Kerbside | 518822 | 175590 | NO2 | LBRuT | 9.3 | 0.9 | No | 2.2 |
| 19 | Kew Rd, Kew (nr. Walpole Av) | Kerbside | 518643 | 176156 | NO2 | LBRuT | 16.0 | 0.7 | No | 2.2 |
| 20 | Mortlake Rd, Kew (nr. Kings Schl) | Kerbside | 519205 | 177221 | NO2 | LBRuT | 2.8 | 0.6 | No | 2.2 |
| 22 | Castelnau, Barnes (nr. Hammersmith Bridge) | Kerbside | 522853 | 177908 | NO2 | LBRuT | 4.2 | 0.5 | No | 2.2 |
| 23(1), 23(2), 23(3) | Castelnau Library, Barnes (static site) | Roadside | 522502 | 177166 | NO2 | LBRuT | 9.0 | 3.3 | Yes | 2.2 |
| 25 | URRW, (nr. East Sheen Primary Schl) | Roadside | 521199 | 175460 | NO2 | LBRuT | 2.5 | 2.3 | No | 2.2 |

| | | | | | | | | | | |
|---------------------------|---|------------------|--------|--------|-----|-------|-------|--------|-----|-----|
| 26 | URRW, Sheen (nr. Courtland Estate) | Roadside | 519168 | 175055 | NO2 | LBRuT | 11.8 | 3.2 | No | 2.2 |
| 28 | Holly Lodge, Richmond Pk | Urban Background | 519445 | 173991 | NO2 | LBRuT | 0.0 | 2175.0 | No | 2.2 |
| 30 | Petershan Rd, nr The Russell Schl, TW10 | Roadside | 518022 | 173165 | NO2 | LBRuT | 1.3 | 1.9 | No | 2.2 |
| 31 | A316 (nr. Chudleigh Rd) | Roadside | 515434 | 174045 | NO2 | LBRuT | 6.4 | 1.0 | No | 2.2 |
| 32 | Kings St, Twickenham (nr Iceland) | Roadside | 516226 | 173195 | NO2 | LBRuT | 3.8 | 1.7 | No | 2.2 |
| 33 | Heath Rd, Twickenham (nr M&S) | Roadside | 515934 | 173126 | NO2 | LBRuT | 6.9 | 3.3 | No | 2.2 |
| 35 | High St, Hampton Wick | Roadside | 517524 | 169583 | NO2 | LBRuT | 1.4 | 1.3 | No | 2.2 |
| 36 | Upper Richmond Road West(URRW), nr j/w Sheen Lane | Roadside | 520540 | 175399 | NO2 | LBRuT | 2.2 | 2.1 | No | 2.2 |
| 37(1), 37(2), 37(3) | Wetlands, Barnes (static site) | Urban Background | 522993 | 176731 | NO2 | LBRuT | 230.0 | 1160.0 | Yes | 2.2 |
| 39 | Richmond Rd, nr Lidl, East Twickenham | Roadside | 517516 | 174331 | NO2 | LBRuT | 2.7 | 1.2 | No | 2.2 |
| 40 | Staines Rd, Twickenham | Kerbside | 514068 | 172435 | NO2 | LBRuT | 11.4 | 1.0 | No | 2.2 |
| 42 | The Quadrant/Kew Rd, Richmond | Kerbside | 518080 | 175259 | NO2 | LBRuT | 2.9 | 0.7 | No | 2.2 |
| 43 | Hill St, Richmond | Kerbside | 517759 | 174757 | NO2 | LBRuT | 1.6 | 0.7 | No | 2.2 |
| 44 | Sheen Rd, Richmond (near shops) | Kerbside | 518489 | 175056 | NO2 | LBRuT | 0.5 | 0.5 | No | 2.2 |
| 45 | High St, Teddington, (nr Cook) | Kerbside | 516383 | 171154 | NO2 | LBRuT | 3.3 | 0.5 | No | 2.2 |

| | | | | | | | | | | |
|----|--|----------|--------|--------|-----|-------|------|-----|----|-----|
| 50 | URRW, nr. Clifford Av, Sheen | Kerbside | 519922 | 175324 | NO2 | LBRuT | 2.7 | 0.7 | No | 2.2 |
| 51 | Sheen Lane, Sheen (nr Thomson Hse Schl) | Roadside | 520492 | 175695 | NO2 | LBRuT | 2.0 | 2.0 | No | 2.2 |
| 52 | Clifford Av, nr Chalkers Corner | Roadside | 519773 | 175795 | NO2 | LBRuT | 2.1 | 2.0 | No | 2.2 |
| 54 | Mortlake Road, adjacent to West Hall Road, Kew | Kerbside | 519585 | 176492 | NO2 | LBRuT | 1.4 | 0.6 | No | 2.2 |
| 55 | Mortlake Road, adj Cemetery Gates, | Kerbside | 519793 | 176142 | NO2 | LBRuT | 4.1 | 0.6 | No | 2.2 |
| 56 | A316 (St Magarets, nr Cassillis Rd) | Kerbside | 516788 | 174519 | NO2 | LBRuT | 9.6 | 1.0 | No | 2.2 |
| 57 | A316 (nr Lincoln Avenue) | Kerbside | 513915 | 172899 | NO2 | LBRuT | 16.4 | 1.0 | No | 2.2 |
| 58 | London Road, Twickenham(nr Twickenham bridge) | Kerbside | 516039 | 173766 | NO2 | LBRuT | 6.4 | 0.7 | No | 2.2 |
| 62 | High Street, Barnes (nr Cook) | Kerbside | 521651 | 176430 | NO2 | LBRuT | 2.3 | 0.4 | No | 2.2 |
| 63 | High Street, Whitton (nr Tesco) | Kerbside | 514188 | 173801 | NO2 | LBRuT | 3.2 | 0.8 | No | 2.2 |
| 64 | High Street, Hampton Hill (nr Tesco) | Kerbside | 514484 | 171251 | NO2 | LBRuT | 1.6 | 0.5 | No | 2.2 |
| 65 | York Street, Twickenham | Kerbside | 516339 | 173366 | NO2 | LBRuT | 2.7 | 0.5 | No | 2.2 |
| 66 | South Circular, Kew Green | Kerbside | 519060 | 177428 | NO2 | LBRuT | 3.3 | 2.1 | No | 2.2 |
| 67 | Petersham Rd opp Poppy Factory, | Roadside | 518042 | 174095 | NO2 | LBRuT | 2.7 | 1.4 | No | 2.2 |
| 68 | Rocks Lane, SW13. | Roadside | 522415 | 176537 | NO2 | LBRuT | 3.2 | 3.8 | No | 2.5 |

| | | | | | | | | | | |
|----|--|----------|--------|--------|-----|-------|-----|-----|----|-----|
| 69 | Uxbridge Rd, nr Longford CI TW12 | Roadside | 513494 | 171729 | NO2 | LBRuT | 2.9 | 2.0 | No | 2.5 |
| 70 | Stag Brewery, Lwr Richmond Rd | Roadside | 520465 | 175965 | NO2 | LBRuT | 2.1 | 1.8 | No | 2.2 |
| 71 | A316, nr St Stephens Primary | Roadside | 516574 | 174456 | NO2 | LBRuT | 9.9 | 2.9 | No | 2.2 |
| 72 | St Margarets Rd, St Margarets (nr. Crown Rd) | Kerbside | 516839 | 174238 | NO2 | LBRuT | 2.5 | 0.8 | No | 2.4 |
| 73 | Hospital Bridge Rd, nr Homelink | Roadside | 513722 | 172873 | NO2 | LBRuT | 8.4 | 2.1 | No | 2.3 |
| 74 | Lower Richmond Rd, Mortlake (nr. Chalker's Corner) | Roadside | 519856 | 175856 | NO2 | LBRuT | 5.9 | 2.6 | No | 2.2 |
| 75 | Hampton Rd (opp Tedd Mem Hosp) | Kerbside | 515459 | 171029 | NO2 | LBRuT | 6.3 | 0.6 | No | 2.2 |
| 76 | Manor Rd, nr Ferry Rd, TW11 | Kerbside | 516588 | 171357 | NO2 | LBRuT | 3.3 | 0.4 | No | 2.2 |
| 77 | Sixth Cross Rd, nr Wellington Rd, TW2 | Roadside | 514705 | 172092 | NO2 | LBRuT | 4.5 | 0.6 | No | 2.3 |
| 79 | South St, outside Lidl, TW2 5NJ | Kerbside | 514810 | 172041 | NO2 | LBRuT | 6.6 | 1.0 | No | 2.2 |
| 80 | Mortlake High St, SW14 | Kerbside | 520538 | 175926 | NO2 | LBRuT | 2.6 | 0.8 | No | 2.4 |
| 81 | Chertsey Ct (A316), | Roadside | 519912 | 175939 | NO2 | LBRuT | 9.2 | 1.6 | No | 2.4 |
| 82 | Twickenham station development | Roadside | 516060 | 173708 | NO2 | LBRuT | 4.8 | 2.5 | No | 2.6 |
| 83 | Thames St, Hampton, nr Plevna Rd, TW12 | Kerbside | 513811 | 169510 | NO2 | LBRuT | 0.9 | 0.3 | No | 2.5 |
| 84 | Queens Rd, Richmond (nr Christs School) | Roadside | 513872 | 169518 | NO2 | LBRuT | 5.2 | 1.7 | No | 2.5 |
| 85 | Richmond bus garage | Roadside | 517911 | 174737 | NO2 | LBRuT | 8.4 | 1.7 | No | 2.5 |

| | | | | | | | | | | |
|--------|--------------------------------------|----------|--------|--------|-----|-------|-----|-----|----|-----|
| Rut 01 | Civic Centre, York St, Twickenham | Roadside | 516415 | 173419 | NO2 | LBRuT | 3.0 | 2.9 | No | 3.5 |
| Rut 02 | George Street, Richmond | Kerbside | 517917 | 174928 | NO2 | LBRuT | 2.2 | 0.7 | No | 2.2 |

Notes:

- (1) 0m if the monitoring site is at a location of exposure (e.g. installed on the façade of a residential property).
- (2) N/A if not applicable.

1.2 Comparison of Monitoring Results with AQOs

Concentration values are those at the location of the monitoring site (bias adjusted and annualised, as required), not those following any fall-off with distance correction.

For results that indicate the exposure estimate, calculated for the nearest residential façade see Table Q.

| Table D. Annual Mean NO ₂ Monitoring Results: Automatic Monitoring (µg/m ³) | | | | | | | | | | |
|--|--------------------|---|--|------|------|------|------|------|------|------|
| Site ID | Site type | Valid data capture for monitoring period % ^(a) | Valid data capture 2023 % ^(b) | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 |
| Castelnau Library, Barnes (R1) | Automatic | 100% | 97% | 31 | 31 | 27 | 20 | 21 | 23 | 16 |
| | Roadside | | | | | | | | | |
| Wetlands Centre, Barnes (R12) | Automatic Suburban | 100% | 47% | 21 | 20 | 21 | 15 | 14 | 14 | 14.2 |

Notes:

The annual mean concentrations are presented as µg m⁻³.

Exceedances of the NO₂ annual mean AQO of 40 µg m⁻³ are shown in **bold**.

NO₂ annual means in excess of 60 µg m⁻³, indicating a potential exceedance of the NO₂ hourly mean AQS objective are shown in **bold and underlined**.

Means for diffusion tubes have been corrected for bias.

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

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

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

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

Table D provides the 2023 results of the NO₂ automatic monitoring and a comparison with the annual mean objective.

The 2023 NO₂ data capture rate for RI1 Castelnau was very good at 97% but for RI2 Wetlands was poor at 47%. 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 14.2µgm⁻³ annualised mean. Details are in Appendix A, Table P. Data capture rate was regrettably low, 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 Wetlands should be used for guidance only.

The 2023 results indicate that both sites met the objective of 40 µg m⁻³. The 2023 raw annual mean for the RI2 (Wetlands) was 13 µg m⁻³ which after annualisation was 14.2µg m⁻³ indicating virtually no change from the 14 µg m⁻³ measured in 2021 and 2022.

This site is a background site and therefore representative of low pollution in the Borough but does demonstrate how difficult it may be to reduce further in line with WHO guidelines of 10ug/m³.

The annual mean at the RI1 (Castelnau) roadside site was 16 µg m⁻³ a significant decrease from 23µg m⁻³ in 2022. This was probably largely due to roadworks. Castelnau experienced significant roadworks/queuing traffic past the Air Quality station in 2022. This is alongside effects of the closure of Hammersmith ridge. Castlenau Air Quality station, 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.. 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 2016-2023 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, where levels of pollutant are significantly higher, later in 2024.

Table E. Annual Mean NO₂ Monitoring Results: Non-Automatic Monitoring

(µg/m³)

| Diffusion Tube ID | X OS Grid Ref (Easting) | Y OS Grid Ref (Northing) | Site Type | Valid Data Capture for Monitoring Period (%) | Valid Data Capture 2023 (%) | NO ₂ Annual Mean Concentration (µg/m ³) | | | | | | |
|---------------------------|-------------------------|--------------------------|-----------|--|-----------------------------|--|-------------|-------------|-------------|-------------|------|------|
| | | | | | | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 |
| 1 | 515824 | 168815 | Roadside | 100 | 100.0 | 55.0 | 41.0 | 35.0 | 25.0 | 26.0 | 22.0 | 19.6 |
| 2 | 513217 | 169746 | Roadside | 100 | 100.0 | 29.0 | 32.0 | 29.0 | 21.0 | 24.0 | 21.0 | 18.6 |
| 4 | 514607 | 171258 | Kerbside | 100 | 100.0 | 36.0 | 35.0 | 31.0 | 27.0 | 28.0 | 24.0 | 22.5 |
| 7 | 515695 | 170983 | Kerbside | 100 | 100.0 | 43.0 | 45.0 | 39.0 | 34.0 | 37.0 | 26.0 | 25.5 |
| 9 | 514846 | 172348 | Kerbside | 100 | 100.0 | 40.0 | 40.0 | 35.0 | 31.0 | 31.0 | 23.0 | 20.9 |
| 10 | 513390 | 172233 | Kerbside | 100 | 100.0 | 42.0 | 41.0 | 40.0 | 33.0 | 33.0 | 26.0 | 24.5 |
| 11 | 514136 | 173389 | Kerbside | 100 | 100.0 | 47.0 | 46.0 | 34.0 | 27.0 | 27.0 | 24.0 | 22.8 |
| 12 | 512612 | 173439 | Kerbside | 100 | 100.0 | 41.0 | 44.0 | 40.0 | 31.0 | 30.0 | 26.0 | 23.2 |
| 13 | 515228 | 174082 | Kerbside | 100 | 100.0 | 42.0 | 40.0 | 39.0 | 36.0 | 30.0 | 24.0 | 21.0 |
| 15 | 517196 | 173933 | Kerbside | 100 | 100.0 | 38.0 | 34.0 | 32.0 | 26.0 | 26.0 | 21.0 | 19.6 |
| 17 | 517822 | 174755 | Kerbside | 100 | 100.0 | 60.0 | 54.0 | 50.0 | 40.0 | 46.0 | 31.0 | 26.8 |
| 18 | 518822 | 175590 | Kerbside | 100 | 84.6 | 58.0 | 46.0 | 46.0 | 41.0 | 39.0 | 30.0 | 30.0 |
| 19 | 518643 | 176156 | Kerbside | 100 | 100.0 | 49.0 | 42.0 | 37.0 | 30.0 | 28.0 | 21.0 | 22.5 |
| 20 | 519205 | 177221 | Kerbside | 100 | 100.0 | 45.0 | 38.0 | 38.0 | 30.0 | 28.0 | 32.0 | 30.2 |
| 22 | 522853 | 177908 | Kerbside | 100 | 100.0 | 52.0 | 45.0 | 32.0 | 21.0 | 22.0 | 17.0 | 17.1 |
| 23(1), 23(2), 23(3) | 522502 | 177166 | Roadside | 100 | 100.0 | 35.0 | 31.0 | 26.0 | 20.0 | 21.0 | 17.0 | 16.4 |
| 25 | 521199 | 175460 | Roadside | 100 | 100.0 | 46.0 | 38.0 | 36.0 | 34.0 | 34.0 | 29.0 | 27.7 |
| 26 | 519168 | 175055 | Roadside | 100 | 92.3 | 40.0 | 36.0 | 34.0 | 32.0 | 33.0 | 28.0 | 27.5 |

| | | | | | | | | | | | | |
|---------------------------|--------|--------|------------------|-----|-------|---------------|---------------|---------------|---------------|-------------|-------------|------|
| 28 | 519445 | 173991 | Urban Background | 100 | 100.0 | 17.0 | 18.0 | 17.0 | 12.0 | 12.0 | 11.0 | 11.0 |
| 30 | 518022 | 173165 | Roadside | 100 | 92.3 | <u>closed</u> | <u>closed</u> | <u>closed</u> | <u>closed</u> | 25.0 | 20.0 | 18.8 |
| 31 | 515434 | 174045 | Roadside | 100 | 92.3 | 52.0 | 49.0 | 45.0 | 35.0 | 35.0 | 31.0 | 30.8 |
| 32 | 516226 | 173195 | Roadside | 100 | 100.0 | 59.0 | 56.0 | 47.0 | 40.0 | 40.0 | 31.0 | 29.7 |
| 33 | 515934 | 173126 | Roadside | 100 | 92.3 | 53.0 | 52.0 | 40.0 | 34.0 | 39.0 | 28.0 | 26.8 |
| 35 | 517524 | 169583 | Roadside | 100 | 100.0 | 45.0 | 42.0 | 36.0 | 32.0 | 30.0 | 25.0 | 22.3 |
| 36 | 520540 | 175399 | Roadside | 100 | 100.0 | <u>60.0</u> | <u>63.0</u> | <u>61.0</u> | 56.0 | 55.0 | 52.0 | 48.3 |
| 37(1), 37(2), 37(3) | 522993 | 176731 | Urban Background | 100 | 100.0 | 20.0 | 21.0 | 20.0 | 14.0 | 14.0 | 14.0 | 13.4 |
| 39 | 517516 | 174331 | Roadside | 100 | 100.0 | 52.0 | 45.0 | 39.0 | 32.0 | 32.0 | 30.0 | 31.6 |
| 40 | 514068 | 172435 | Kerbside | 100 | 100.0 | 42.0 | 41.0 | 35.0 | 29.0 | 29.0 | 24.0 | 23.0 |
| 42 | 518080 | 175259 | Kerbside | 100 | 100.0 | <u>89.0</u> | <u>72.0</u> | <u>62.0</u> | <u>60.0</u> | 54.0 | 41.0 | 37.8 |
| 43 | 517759 | 174757 | Kerbside | 100 | 100.0 | <u>78.0</u> | 59.0 | 46.0 | 41.0 | 43.0 | 39.0 | 36.4 |
| 44 | 518489 | 175056 | Kerbside | 100 | 100.0 | 41.0 | 40.0 | 37.0 | 33.0 | 32.0 | 29.0 | 28.6 |
| 45 | 516383 | 171154 | Kerbside | 100 | 100.0 | 35.0 | 33.0 | 32.0 | 26.0 | 26.0 | 20.0 | 20.0 |
| 50 | 519922 | 175324 | Kerbside | 100 | 100.0 | 53.0 | 52.0 | 50.0 | 45.0 | 46.0 | 39.0 | 38.2 |
| 51 | 520508 | 175797 | Roadside | 100 | 100.0 | 35.0 | 33.0 | 30.0 | 24.0 | 23.0 | 19.0 | 19.4 |
| 52 | 519773 | 175795 | Roadside | 100 | 100.0 | 50.0 | 59.0 | 55.0 | 46.0 | 45.0 | 39.0 | 36.4 |
| 54 | 519585 | 176492 | Kerbside | 100 | 100.0 | 48.0 | 40.0 | 40.0 | 32.0 | 30.0 | 26.0 | 25.3 |
| 55 | 519793 | 176142 | Kerbside | 100 | 100.0 | 45.0 | 41.0 | 40.0 | 33.0 | 29.0 | 26.0 | 25.6 |
| 56 | 516788 | 174519 | Kerbside | 100 | 92.3 | 50.0 | 43.0 | 39.0 | 31.0 | 29.0 | 23.0 | 20.6 |
| 57 | 513915 | 172899 | Kerbside | 100 | 100.0 | 42.0 | 43.0 | 37.0 | 29.0 | 29.0 | 23.0 | 23.2 |
| 58 | 516039 | 173766 | Kerbside | 100 | 100.0 | 47.0 | 43.0 | 40.0 | 33.0 | 31.0 | 25.0 | 21.9 |
| 62 | 521651 | 176430 | Kerbside | 100 | 100.0 | 50.0 | 43.0 | 43.0 | 32.0 | 32.0 | 25.0 | 24.2 |
| 63 | 514188 | 173801 | Kerbside | 100 | 100.0 | 38.0 | 38.0 | 33.0 | 27.0 | 27.0 | 30.0 | 24.7 |

| | | | | | | | | | | | | |
|----|--------|--------|----------|-----|-------|-----------------|-----------------|-----------------|-----------------|-----------------|------|------|
| 64 | 514484 | 171251 | Kerbside | 100 | 100.0 | 49.0 | 45.0 | 41.0 | 34.0 | 35.0 | 30.0 | 27.6 |
| 65 | 516339 | 173366 | Kerbside | 100 | 92.3 | 68.0 | 55.0 | 50.0 | 40.0 | 40.0 | 33.0 | 30.2 |
| 66 | 519060 | 177428 | Kerbside | 100 | 100.0 | 49.0 | 42.0 | 40.0 | 32.0 | 30.0 | 27.0 | 24.9 |
| 67 | 518042 | 174095 | Roadside | 100 | 100.0 | 44.0 | 41.0 | 32.0 | 23.0 | 23.0 | 21.0 | 20.4 |
| 68 | 522415 | 176537 | Roadside | 100 | 100.0 | Not open | 55.0 | 40.0 | 31.0 | 30.0 | 25.0 | 23.6 |
| 69 | 513494 | 171729 | Roadside | 100 | 100.0 | Not open | 38.0 | 31.0 | 22.0 | 23.0 | 20.0 | 19.5 |
| 70 | 520465 | 175965 | Roadside | 100 | 100.0 | Not open | Not open | 42.0 | 33.0 | 34.0 | 27.0 | 30.2 |
| 71 | 516574 | 174456 | Roadside | 100 | 92.3 | Not open | Not open | 52.0 | 43.0 | 39.0 | 34.0 | 33.0 |
| 72 | 516839 | 174238 | Kerbside | 100 | 100.0 | Not open | Not open | 42.0 | 33.0 | 30.0 | 26.0 | 23.3 |
| 73 | 513722 | 172873 | Roadside | 100 | 92.3 | Not open | Not open | 43.0 | 36.0 | 34.0 | 28.0 | 26.8 |
| 74 | 519856 | 175856 | Roadside | 100 | 92.3 | Not open | 50.0 | 52.0 | 43.0 | 44.0 | 32.0 | 31.1 |
| 75 | 515459 | 171029 | Kerbside | 100 | 100.0 | Not open | Not open | Not open | 29.0 | 29.0 | 25.0 | 25.3 |
| 76 | 516588 | 171357 | Kerbside | 100 | 100.0 | Not open | Not open | Not open | 35.0 | 35.0 | 30.0 | 23.1 |
| 77 | 514705 | 172092 | Roadside | 100 | 100.0 | Not open | Not open | Not open | 38.0 | 37.0 | 31.0 | 27.2 |
| 79 | 514810 | 172041 | Kerbside | 100 | 100.0 | Not open | Not open | Not open | 33.0 | 32.0 | 25.0 | 23.2 |
| 80 | 520538 | 175926 | Kerbside | 100 | 100.0 | Not open | Not open | Not open | Not open | 30.0 | 24.0 | 23.2 |
| 81 | 519912 | 175939 | Roadside | 100 | 100.0 | Not open | Not open | Not open | Not open | 30.0 | 32.0 | 32.0 |
| 82 | 516060 | 173708 | Roadside | 100 | 100.0 | Not open | Not open | Not open | Not open | Not open | 21.0 | 19.9 |

| | | | | | | | | | | | | |
|--------|--------|--------|----------|-----|-------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|-------------|
| 83 | 513811 | 169510 | Kerbside | 100 | 100.0 | <u>Not open</u> | <u>Not open</u> | <u>Not open</u> | <u>Not open</u> | <u>Not open</u> | 30.0 | 27.6 |
| 84 | 513872 | 169518 | Roadside | 100 | 100.0 | <u>Not open</u> | <u>Not open</u> | <u>Not open</u> | <u>Not open</u> | <u>Not open</u> | <u>Not open</u> | 16.0 |
| 85 | 517911 | 174737 | Roadside | 100 | 84.6 | <u>Not open</u> | <u>Not open</u> | <u>Not open</u> | <u>Not open</u> | <u>Not open</u> | <u>Not open</u> | 39.5 |
| Rut 01 | 516415 | 173419 | Roadside | 100 | 100.0 | 51.0 | 38.0 | 36.0 | 29.0 | 27.0 | 24.0 | 23.0 |
| Rut 02 | 517917 | 174928 | Kerbside | 100 | 100.0 | <u>96.0</u> | <u>82.0</u> | <u>72.0</u> | <u>63.0</u> | <u>52.0</u> | <u>43.0</u> | 40.0 |

Annualisation has been conducted where data capture is <75% and >25% in line with LLAQM.TG19

Diffusion tube data has been bias adjusted

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

Notes:

The annual mean concentrations are presented as $\mu\text{g m}^{-3}$.

Exceedances of the NO₂ annual mean AQO of 40 $\mu\text{g m}^{-3}$ are shown in **orange and bold**.

NO₂ annual means in excess of 60 $\mu\text{g m}^{-3}$, indicating a potential exceedance of the NO₂ hourly mean AQS objective are shown in **red, bold and underlined**. In 2023 no site exceeded 60 $\mu\text{g}/\text{m}^3$ after bias correction.

Means for diffusion tubes have been corrected for bias.

All means have been “annualised” in accordance with LLAQM Technical Guidance if valid data capture for the calendar year is less than 75% and greater than 25%. **This applied to The Wetlands Centre automatic analyser only in 2023.**

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

(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** sites is **0.86** calculated using **the local bias adjustment factor for Castlenau Air Quality monitoring station**. The bias adjustment factor for **background sites** 28 and 37 is also **0.86** calculated using the roadside **Castlenau Air Quality monitoring station** but in fact results remain the same for both background sites whether using the local roadside factor of 0.86 or the National bias adjustment factor of 0.83 for 50% TEA/acetone for Gradko. Bias adjusted results for both sites are the same. Data capture rate at Wetlands background site fell below acceptable levels required by Defra, so could not be used for bias adjustment. Data capture at Castelnau (RI1) was 97%, which is above the 90% required by DEFRA and at Wetlands (RI2) was 47%, below the 90% required by DEFRA. For more information, see Appendix A.2.

Notes on sites:

From 3/1/23 site 27 was closed. This site was moved further down the road to the next school, renamed site 84 and site 85 was opened. Site 51 on Sheen Lane, moved back to o/s Thomson Hse Schl, co-located with new BL node.

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.

Annual Mean NO2 Monitoring Results: Non Automatic Monitoring (ug/m3)

Table E shows the NO2 diffusion tube monitoring results, with bias corrected values for each year from 2017 to 2023. (Note – see Appendix B for full monthly data for 2023, including distance corrected, where relevant).

The data capture for 2023 for all diffusion tube sites was very good (98.3%). No site recorded a data capture of less than 75%, so no annualisation was required for greater 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 total number of sites in 2023 where monitoring was undertaken was 65; two of these were triplicates, co-located next to real time automatic analysers. Two sites were background the remainder, 63 were roadside or kerbside.

The results borough wide are encouraging for 2023, continuing the previous few years' downward trend in levels of NO2.

The 2023 monitoring results show that the Defra objective of 40 $\mu\text{g m}^{-3}$ was exceeded at just 3 sites (4.6%) and complied at 62 sites (95.4%). This is very similar to 2022 except there were 64 rather than 65 sites, where 3 sites (4.7%) exceeded and 61 sites (95.3%) complied. The 3 sites that exceeded were site 36 on URRW (48.3 $\mu\text{g/m}^3$), site Rut 2 in George St Richmond (40 $\mu\text{g/m}^3$) and site 85 Richmond bus garage (39.5 $\mu\text{g/m}^3$ – 40 $\mu\text{g/m}^3$ when rounded to nearest whole number). These headline figures are very encouraging, especially as two out of three that exceeded recorded exactly 40 $\mu\text{g/m}^3$. With even slight reductions these should comply in 2024. For those that complied, 38 sites (58.5%), over half, measured less than 30 $\mu\text{g/m}^3$ and 12 sites (18.5%) recorded under 40 $\mu\text{g/m}^3$ and 12 sites (18.5%) under 20 $\mu\text{g/m}^3$. Levels of NO₂ really are coming down. If we compare this to pre COVID 2018, out of 64 sites, 41 sites (64.1%) exceeded the objective of 40 $\mu\text{g m}^{-3}$ (3 also exceeding 60 $\mu\text{g/m}^3$, so likely to exceed the hourly limit value) and only 1 site (1.6%), site 28 in Richmond Park, recorded below 20 $\mu\text{g/m}^3$ (18 $\mu\text{g/m}^3$). In terms of overall annual reductions in pollution the borough has seen significant reductions with the trajectory being towards further reductions

From the 65 monitoring sites in 2023, 49 sites monitored reductions, 11 sites saw no movement and 3 sites saw increases. On the whole improvements were slight, much slighter than from 2021 to 2022. Many sites, especially those recording lower levels, reduced by an annual average of 1 $\mu\text{g/m}^3$. This is to be expected as concentrations reach lower levels, since continuing reductions, whilst desirable and necessary, require significantly more action by us all. Some levelled out, showing no movement.

The most significant reductions were at sites where levels were higher - site 36, on Upper Richmond Rd West near Sheen Lane in East Sheen where a reduction of 4 $\mu\text{g/m}^3$ was recorded, down from 52 $\mu\text{g/m}^3$ in 2022 to 48.3 $\mu\text{g/m}^3$ in 2023. This is closely followed by site 42, Kew Rd, Richmond where levels reduced by 3 $\mu\text{g/m}^3$ from 41 $\mu\text{g/m}^3$ down to 37.8 $\mu\text{g/m}^3$. Whilst both reductions are welcome, more work is needed. This is because the more we understand about the health effects of air quality the more we are aware of harm to health that can occur below the UK limit values of 40 $\mu\text{g/m}^3$. Site 36 is on the South Circular, a TFL managed

road, not under local authority control. 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. It is also a busy bus route for buses 33, 337, 493. Electric buses would help. Route 33 is due to be electrified in November 2024. Further and faster upgrades of the TfL bus routes are desirable, which the Council support and encourage. Pressure for major development nearby at the Stag Brewery site and Barnes hospital may further exacerbate matters without careful traffic considerations.

Site 42 is close to the taxi rank and opposite Richmond station with multiple bus stops. This is good news as much effort had been put in by the Council and TfL to raise awareness to reduce idling from both taxis and buses and to upgrade the TfL bus fleet. Further and faster upgrades of the TfL bus fleet are desirable here too, which again the Council support and encourage.

The 3 sites where NO₂ levels increased were site 39, 19 and 70. 39 is in East Twickenham. Much of this specific increase is probably due to roadworks/queuing traffic for significant public realm improvements from Spring 2023 until Spring 2024. Improvements are now complete with additional tree planting and wider pavements to enhance the pedestrian experience and to encourage more walking to the local shopping area in East Twickenham. Site 19 on Kew Rd and site 70 on Lower Richmond Rd, outside the main entrance to the Stag brewery development, are sited on roads which run parallel to the South Circular and may have been impacted by displacement traffic before/after the extension of the ULEZ on 29/8/23. Increases at site 70 are of concern, since the Stag Brewery development with Senior School, 1000+ residential, cinema, restaurants and many commercial and leisure facilities will only increase traffic in this area. The Inquiry to decide the fate of the Stag Brewery planning application commenced on 30th May 2024 just as this report was submitted, therefore the current outcome is unknown.

For the third year in the last 20 years of monitoring in the borough, after bias adjustment, no site has exceeded 60ug/m³, which is very good news and appears set to continue. However, site 36 on Upper Richmond Rd West near Sheen Lane in East Sheen, has now gained the undesirable accolade of being the worst polluted location in the borough. Levels have reduced in 2023, as advised above, and in 2023, after bias adjustment recorded 48.3 µg m⁻³ down from 55µg m⁻³ in 2022. Whilst this is a significant reduction further improvements are still needed. The extended ULEZ expansion to outer London may help speed reductions here. Since the extended ULEZ was only operative for the last third of 2023, (from 29/8/23) we will try to map the impact in our 2024 report. Again the Council would support and encourage further and faster upgrades/electrification of the TfL bus fleet in this area.

The effect on improvements in air quality exclusively due to the extended ULEZ on 29/8/24 is difficult to say with any degree of certainty. It is early days and included just 4 months of 2023. We are awaiting the Mayor's report for outer London. We know it removed many older more polluting vehicles from the fleet and we are advised that it resulted in an overall 10% increase in compliant vehicles seen driving in London on an average day up from 85% in May 2022 to 95% in September 2023. The full report is here . However, without knowing how many miles these travelled, at what times and what replaced them, it is difficult to quantify emission reductions solely from the extended ULEZ. Clearly upgraded vehicles will have helped speed up reductions and more importantly, some residents may have been encouraged to give up their private vehicles in favour of more sustainable transport such as cycling or public transport – this will also help to reduce congestion, and improve both health and air quality. The 21% reductions outlined in the Mayor of London's report for inner London are unlikely to be repeated for outer London, where reductions in levels may be significantly lower. However all reductions are welcome.

The Council has carried out considerable extra monitoring in 2023 linked to proposed road changes – an LTN in Hampton Hill, the introduction of the extended ULEZ next to East Sheen Primary School in East Sheen, and continued to measure 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 D at the end of the report for results for schools monitored in 2023. These are also available on the Council website here. The final set of school data for 2024 will be available in 2025 ASR.

2023 has likely witnessed the settling-in of the new “norm” for work travel. For occupations that have allowed , COVID changed the way many people want to work with 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. Levels in 2023 are significantly better than in 2019 at the height of lockdown, when 27 x sites (42%) exceeded the UK limit value of 40ug/m³. These are significant reductions and confirm the downward trend in air pollution, which is very encouraging.

Significantly, after distance correction for nearest façade, the annual mean objective in 2023 was exceeded at just 1 site, site 36, down from 2 in 2022 and 5 in 2021. None, after bias adjustment, exceeded the annual mean concentration of 60 µg m⁻³ in 2023, 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 – 24, 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 in 2023 to delay the ban on the sale of pure internal combustion engine vehicles from 2030 to 2035 is unfortunate. According to the SMMT (Society of Motor manufacturers and Traders) 2023 witnessed the best year in new car registrations since 2019. It again saw an increase in sales of electric vehicles, plug-ins and hybrids, which totalled approximately a third of all new car sales in 2023, whilst diesel sales, including diesel hybrids 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 2023, 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 2023, they issued 10,484 warnings to drivers and in the last 5 years have issued over 53,000 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 of 1 ug/m³ at site 71 and 56 and no change at sites

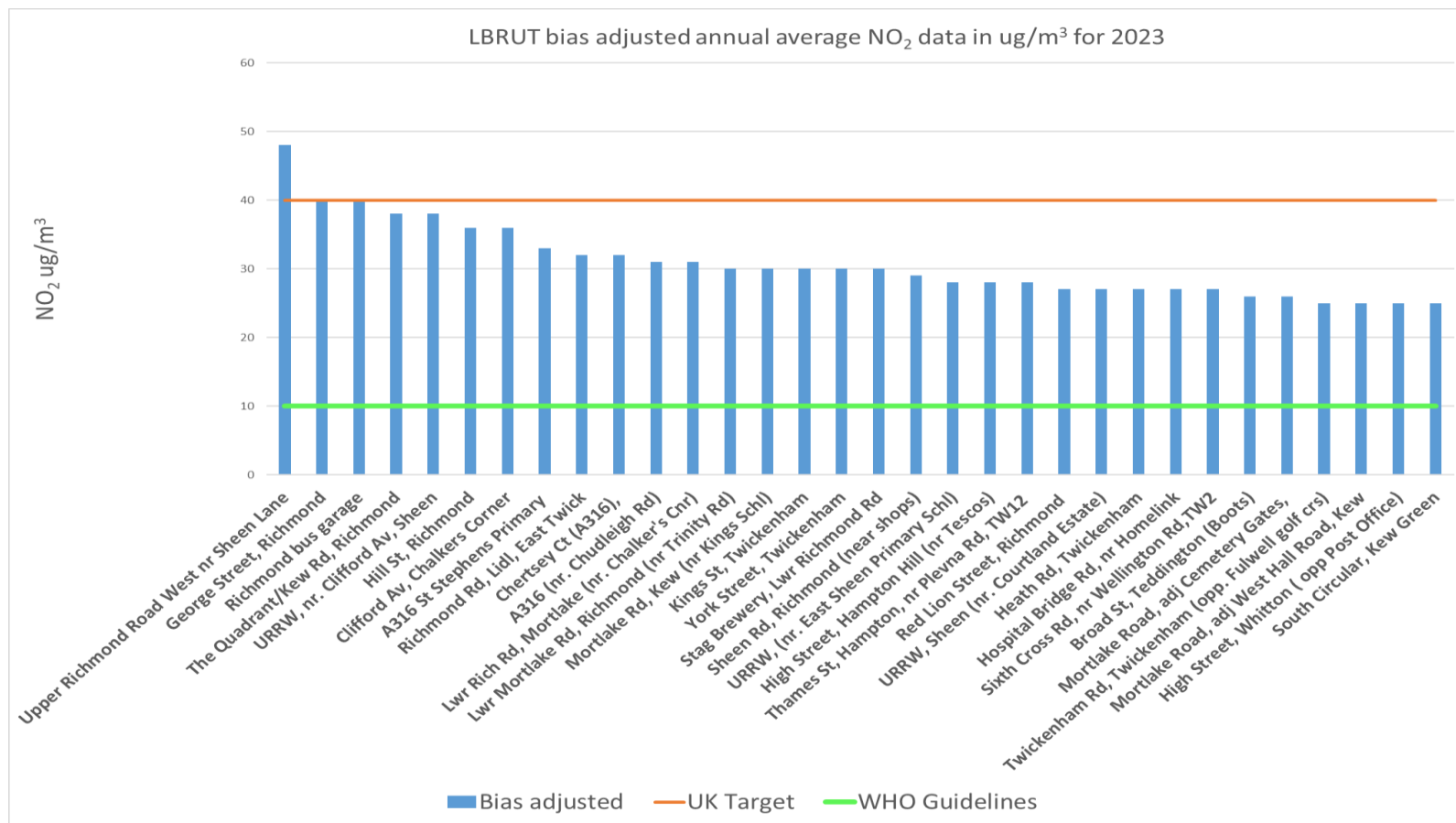
57, 31 and 18 for 2023. In 2023 none of these sites along the A316 exceeded the annual bias adjusted value of 40ug/m³. Sites 56, 57 and 18 measured below 30ug/m³ – very good news.

The overall monitoring results for the Borough in 2023 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 however remain optimistic that it will continue on a downward trajectory. Reductions beyond UK limit values are welcome; we would like to aim to achieve 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, including both a red line for the UK limit value of 40ug/m³ and a green line for the WHO guideline of 10 ug/m³. A map showing locations is below – 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 – 2023 to give more perspective to levels of NO₂ over a long time period. We hope this is enlightening.

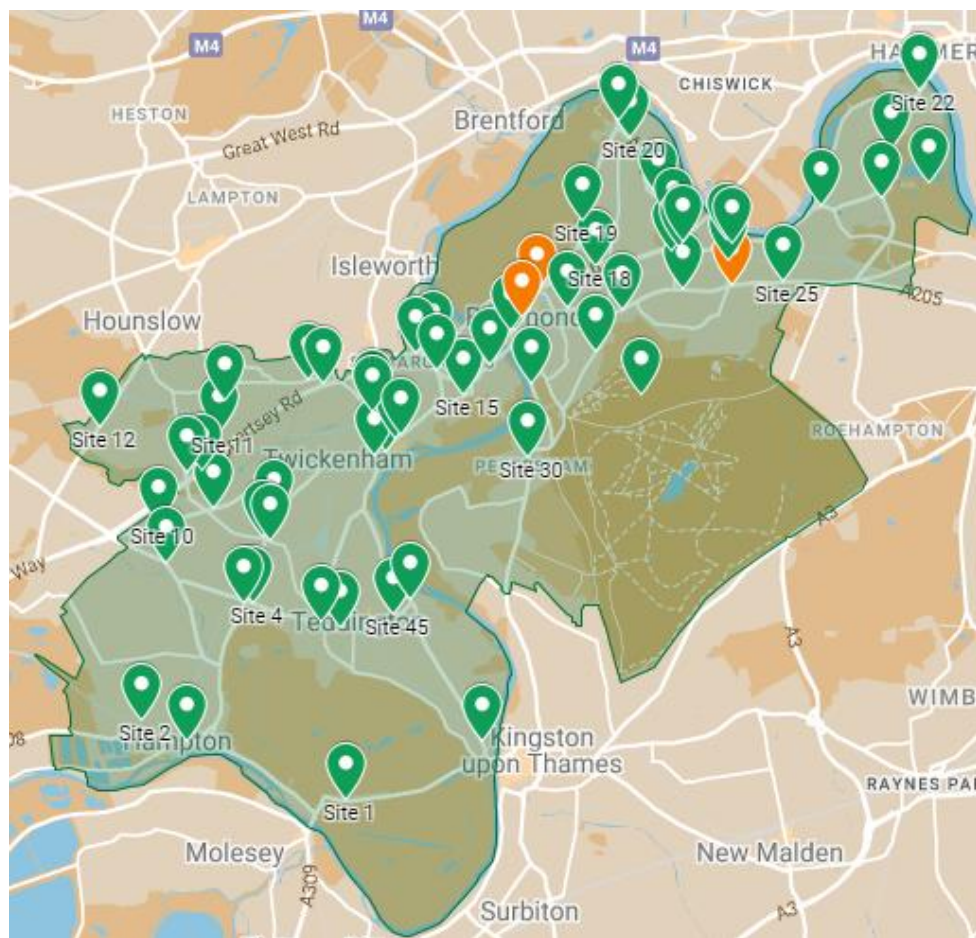
Figure 1: Nitrogen Dioxide Bias Adjusted Annual Average Concentrations for all sites for 2023 (split over 2 graphs)



LBRUT bias adjusted annual average NO₂ data in ug/m³ for 2023





Map of NO2 diffusion tube sites in LBRUT in 2023




All results are annual bias adjusted

Key:

 0-39 $\mu\text{g}/\text{m}^3$ (complies with EU/UK annual NO2 limit value)

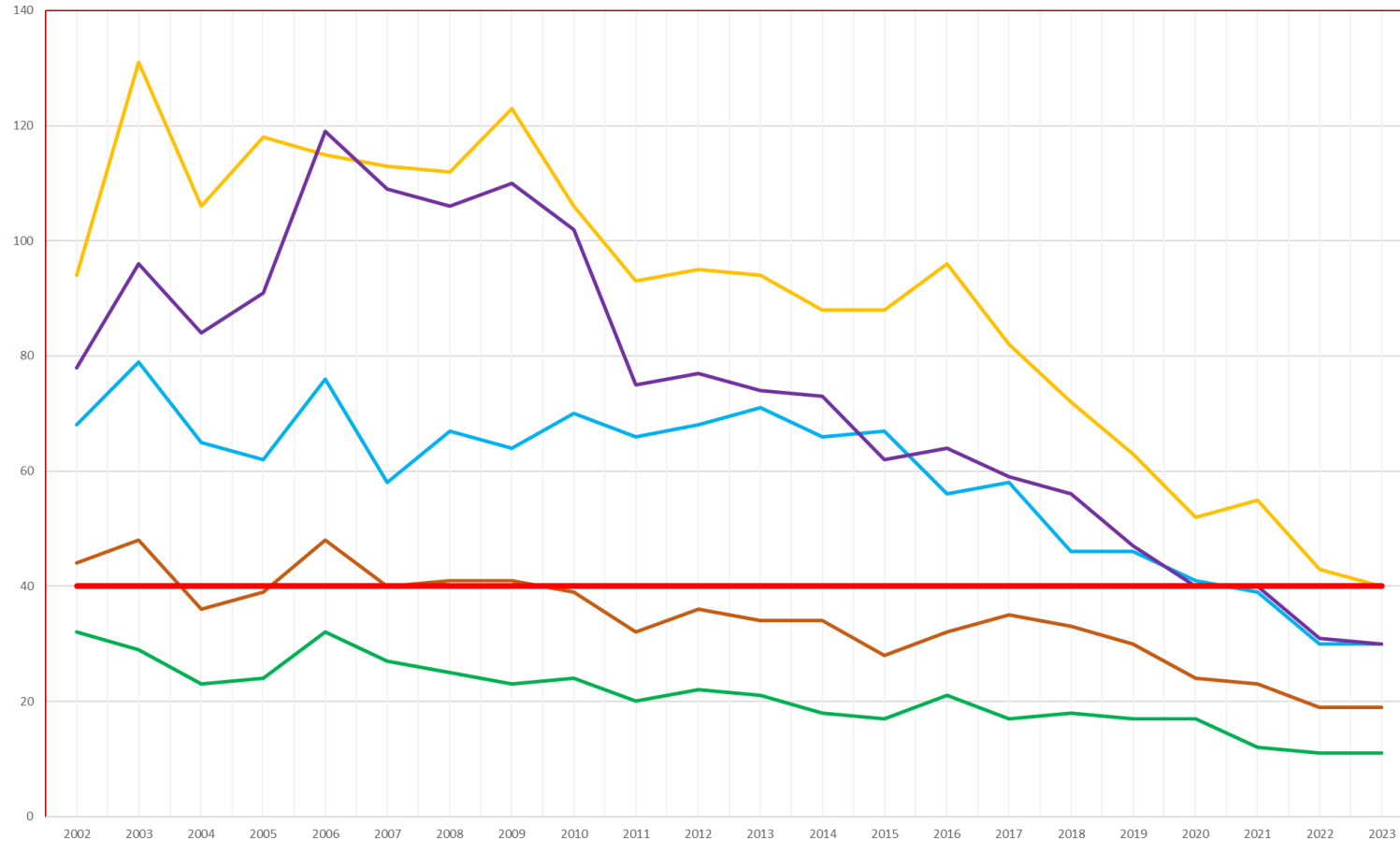
 40-59 $\mu\text{g}/\text{m}^3$ (exceeds EU/UK annual NO2 limit value)

 60 $\mu\text{g}/\text{m}^3$ and over (exceeds EU/UK annual NO2, likely exceeds EU/UK hourly NO2 limit value)

<https://www.google.com/maps/d/viewer?mid=1FXi3kxJxB-OJOYKU1JqQp-liTHfcCH5&ll=51.43908395006437%2C-0.33272889246094506&z=12>

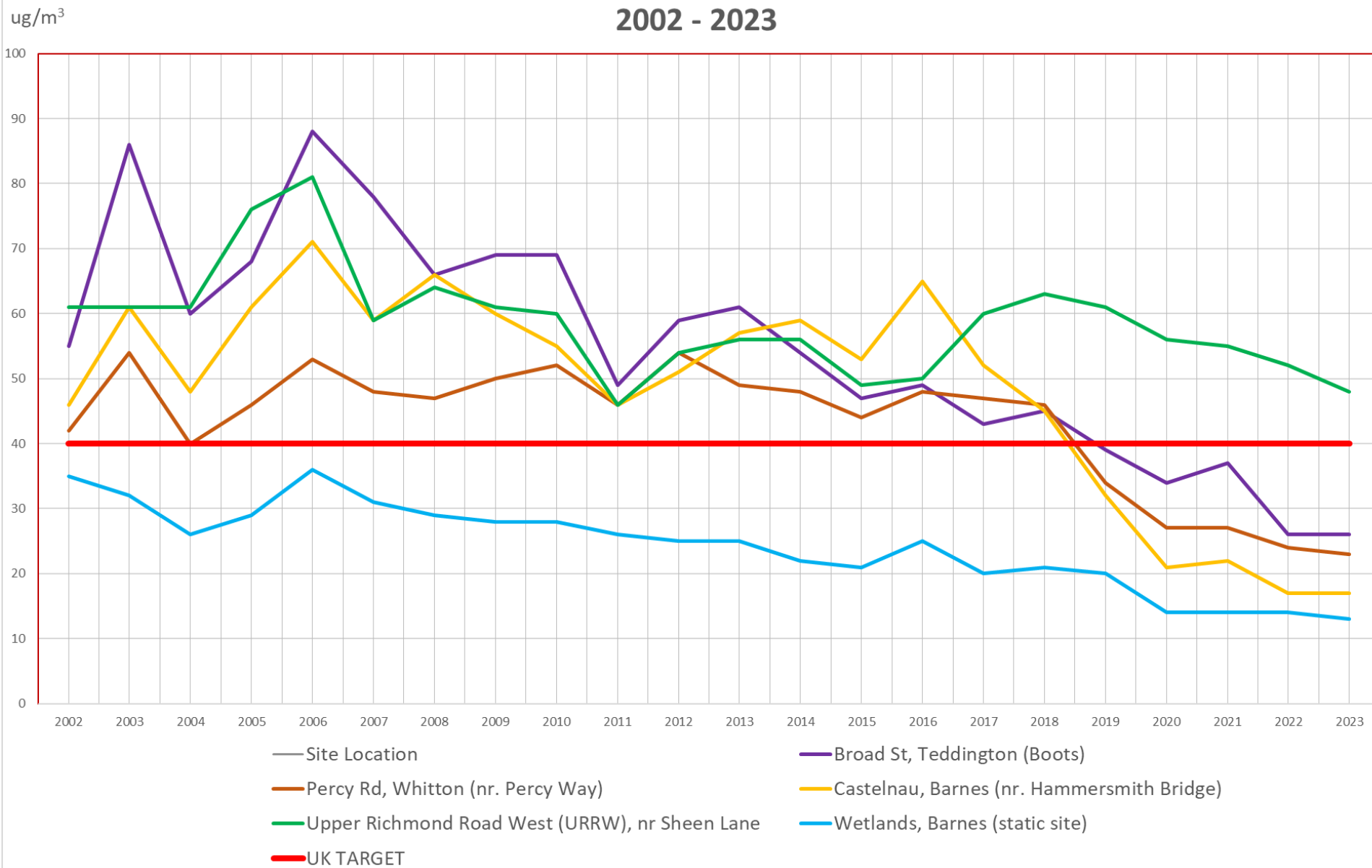
NO₂ biased adjusted annual average data in ug/m³ at sites across LBRuT 2002-2023

ug/m³



- Site Location
- 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

NO₂ biased adjusted annual average data in ug/m³ at sites across LBRuT 2002 - 2023



NO₂ biased adjusted annual average data in ug/m³ at sites across LBRuT 2002 - 2023

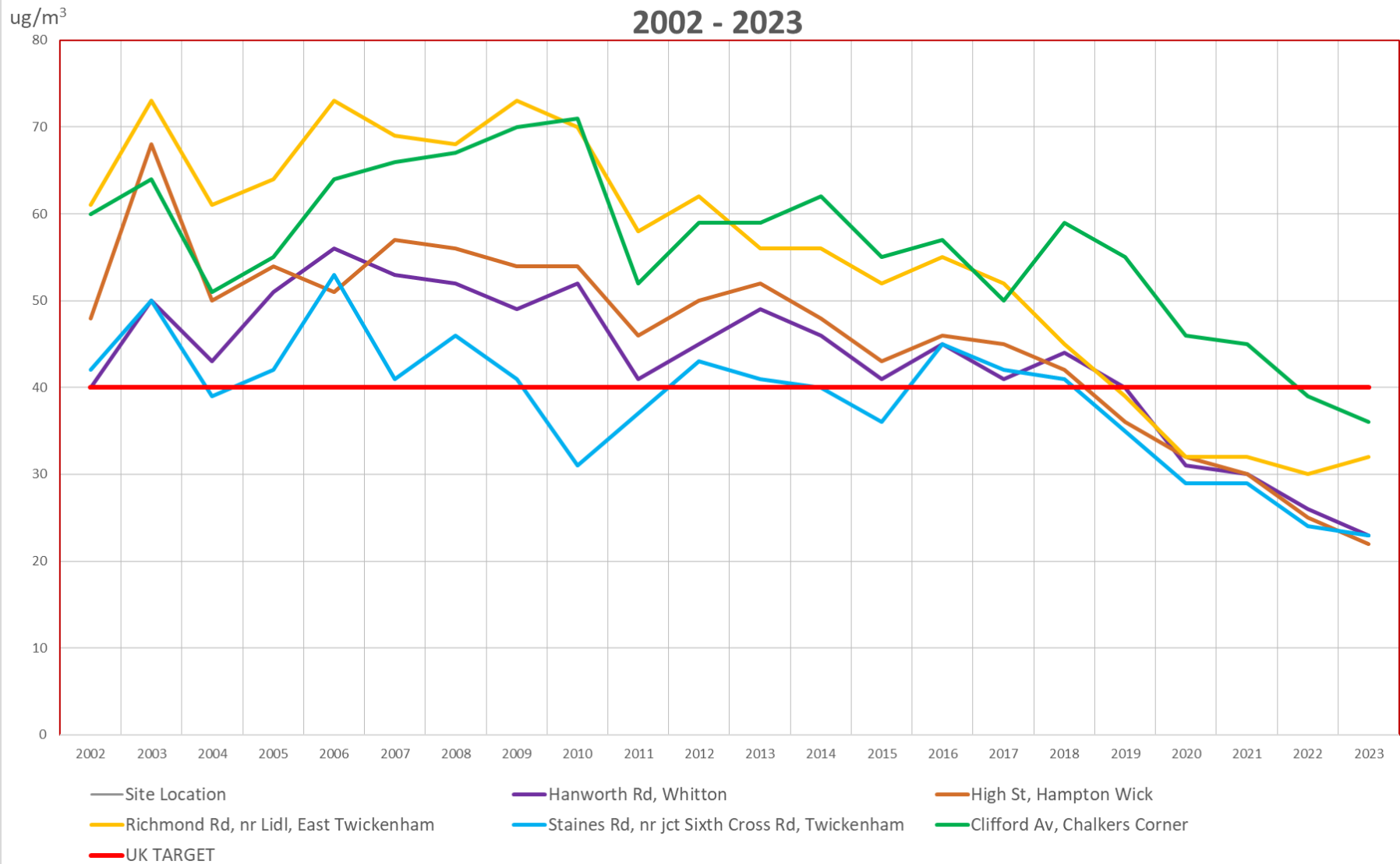


Table F NO₂ Automatic Monitor Results: Comparison with 1-hour Mean Objective

| Site ID | Valid data capture for monitoring period % ^(a) | Valid data capture 2023 % ^(b) | Number of Hourly Means > 200 µg m ⁻³ | | | | | | |
|--|---|--|---|------|------|------|------|------|--------------|
| | | | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 |
| Castelnau Library, Barnes (RI1) | 100 | 97 | 0 | 0 | 0 | 0 | 0 | 0 | 0 (0) |
| Wetlands Centre, Barnes (RI2) | 100 | 47 | 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 NO₂ 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: Barnes Wetlands - Nitrogen Dioxide achieved a capture rate less than 90% for the year (47%). Results may not be representative of the full year and should be used for guidance only. Steps have been taken to improve data capture and a new provider has been selected to oversee Richmond’s air quality stations from March 2024.

Table F 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 very good news. The data for 2023 at RI1 and RI2 is fully ratified.

Table G. Annual Mean PM₁₀ Automatic Monitoring Results (µg m⁻³)

| Site ID | Valid data capture for monitoring period % ^b | Valid data capture 2023 % ^b | Annual Mean Concentration (µgm ⁻³) | | | | | | |
|---------------------------------|---|--|--|------|------|------|------|------|------|
| | | | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 |
| Castelnau Library, Barnes (R11) | 100 | 98 | 18 | 19 | 15 | 15 | 16 | 15 | 15 |
| Wetlands Centre, Barnes (RI2) | 100 | 63 | 15 | 15 | 16 | 16 | 15 | 14 | 12 |
| NPL - Teddington AURN | 100 | 19 | N/A | N/A | N/A | 13 | 12 | 14 | 16 |

Notes

The annual mean concentrations are presented as $\mu\text{g m}^{-3}$.

Exceedance of the PM₁₀ annual mean AQO of $40 \mu\text{g m}^{-3}$ 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%. Wetlands achieved 63% data capture in 2023 so these results have been annualised – see Appendix A, Table P.

(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 PM₁₀. 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, PM₁₀ is a specified pollutant for the whole Borough AQMA.

Table G provides results of automatic monitoring of PM₁₀ and a comparison with the annual mean objective. The objective of $40 \mu\text{g m}^{-3}$ was met at all sites for every year reported. All data is fully ratified.

The 2023 annual mean for PM₁₀ at the roadside site in Castelnau Barnes remained at $15\mu\text{g}/\text{m}^3$ in 2023, this is the same as 2022 and in fact has recorded $15\mu\text{g}/\text{m}^3$ in 2019, 2020, 2022 and 2023, recording $16 \mu\text{g}/\text{m}^3$ in 2021. The 2023 annual mean for PM₁₀ at the background site at the Wetlands Centre in Barnes decreased from $14\mu\text{g}/\text{m}^3$ to $12\mu\text{g}/\text{m}^3$ 2022 to 2023. This is interesting. Whilst the roadside site is proving exceedingly difficult to reduce, the background site at last appears to witness reductions. The reduction however is slight and may increase again slightly in 2024. The AURN site at NPL Teddington, also a background site, witnessed an

increase from 14ug/m³ to 16ug/m³ – which is higher than the previous 4 years. However, Teddington’s data is based on a very poor data capture rate of 19% so should be treated with extreme caution. We will keep a close eye on levels. 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 – 2023 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 G and H provide results for the period from 2016 to 2023 inclusive. PM₁₀ measurement was undertaken at three sites and the data capture was very good at one site - R11 Castelnau achieving 98% but poor at R12 Wetlands achieving 63%, and poor at TDO, Bushy Park, Teddington NPL achieving 19%. 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. Over the 7-year period from 2017 – 2023 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 M 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 in 2024 and invest Section 106 funding in adding PM2.5 to our existing network.

Table H. PM₁₀ Automatic Monitoring Results: Comparison with 24-Hour Mean Objective, Number of PM₁₀ 24-Hour Means > 50 µg m⁻³

| Site ID | Valid data capture for monitoring period % ^(a) | Valid data capture 2023 % ^(b) | Number of Daily Means > 50 µg m ⁻³ | | | | | | |
|---------------------------------|---|--|---|------|------|------|------|------|----------|
| | | | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 |
| Castelnau Library, Barnes (RI1) | 100 | 98 | 4 | 1 | 3 | 0 | 0 | 1 | 1 |
| Wetlands Centre, Barnes (RI2) | 100 | 63 | 3 | 0 | 3 | 0 | 0 | 1 | 1 |
| NPL - Teddington AURN | 100 | 19 | N/A | N/A | N/A | 2 | 0 | 1 | 2 |

Notes

Exceedances of the PM₁₀ 24-hour mean objective (50 µg m⁻³) over the permitted 35 days per year) are shown in **bold**.

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

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

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

Table H provides the comparison with the 24-hour mean objective for PM10. The objective of no more than 35 days exceeding 50 $\mu\text{g m}^{-3}$ was met at each site for all years reported. In 2023, 1 exceedance was recorded at 2 sites (Castlenau and Wetlands) and 2 exceedences was recorded at NPL Bushy Park (CAUTION: poor data capture at Wetlands and NPL Bushy Park). 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 I. Annual Mean PM_{2.5} Automatic Monitoring Results (µg m⁻³)

| Site ID | Valid data capture for monitoring period % ^(a) | Valid data capture 2023 % ^(b) | Annual Mean Concentration (µgm ⁻³) | | | | | | |
|---|---|--|--|------|------|------|------|------|------|
| | | | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 |
| NPL Bushy Park, Teddington (TD5) | 100 | 19 | 10 | 11 | 12 | 8 | 8 | 9 | 12 |

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 2023 is provisional data and has not been fully ratified so should be treated with caution.

Table I provides results of automatic monitoring of PM_{2.5} by NPL in Bushy Park, a background site, and a comparison with the annual mean objective.

Annual mean for 2023 is 12 ug/m³, an increase of 3ug/m³ from 2022 – but CAUTION – poor data capture (19%). 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 PM_{2.5} monitor but at least one is planned for Richmond town centre later in 2024.

2. Action to Improve Air Quality

2.1 Air Quality Management Areas

Air Quality Management Areas (AQMAs) are declared when there is an exceedance or likely exceedance of an air quality objective. After declaration, the authority should prepare an Air Quality Action Plan (AQAP) within 12 months. The AQAP should specify how air quality targets will be achieved and maintained, and provide dates by which measures will be carried out.

A summary of the whole borough AQMA declared by the London Borough of Richmond upon Thames can be found in

Table C. The table presents a description of the single whole borough AQMA that is currently designated within the London Borough of Richmond upon Thames. Appendix C provides a map of the AQMA (the whole borough) and also the air quality monitoring locations within the AQMA. The air quality objectives pertinent to the current AQMA designation are as follows:

- NO₂ annual mean;
- PM₁₀ annual mean;

No changes to the AQMA are currently proposed.

Table C. Declared Air Quality Management Areas

| AQMA Name | Date of Declaration | Pollutants and Air Quality Objectives | One Line Description | Is air quality in the AQMA influenced by roads controlled by Highways England? | Level of Exceedance: Declaration | Level of Exceedance: Current Year | Number of Years Compliant with Air Quality Objective | Name and Date of AQAP Publication | Web Link to AQAP |
|--|---------------------|---------------------------------------|----------------------|--|----------------------------------|-----------------------------------|--|--|--|
| London Borough of Richmond upon Thames | 01 December 2000 | NO ₂ annual mean | LBRuT | NO | 90.6 in 2002 | 48.3 in 2023 | 0 years | London Borough of Richmond upon Thames Air Quality Action Plan (2020-2025). Published March 2020 | Visit the AQAP https://www.richmond.gov.uk/media/apcobnkp/ |
| | | PM ₁₀ annual + 24hr mean | | | 47 x exceedence site out of 57 | 3 x exceedence sites out of 65 | | | |

- The London Borough of Richmond upon Thames confirm the information on UK-Air regarding their AQMA is up to date
- The London Borough of Richmond upon Thames confirm that all current AQAPs have been submitted to GLA

2.2 Air Quality Action Plan Progress

The Council approved an updated AQAP for 2020 – 2025 on 10th March 2020. The AQAP 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 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.

Members want to prioritise air quality in LBRuT and have asked Officers to develop an ambitious new AQAP in 2024, a year earlier than required. Officers have engaged with Community groups from the outset, whose ideas and opinions will be employed to shape the new AQAP. This is currently in progress and will be reported in our 2025 ASR.

Table M provides a brief summary of the London Borough of Richmond upon Thames’ progress against the Air Quality Action Plan, showing progress made this year. New projects, which commenced in 2023, are shown at the bottom of the table.

Table M. Delivery of Air Quality Action Plan Measures

| Measure | LLAQM Action Matrix Theme | Action | <p style="text-align: center;">Progress</p> <ul style="list-style-type: none"> • Emissions/Concentration data <ul style="list-style-type: none"> • Benefits • Negative impacts / Complaints |
|---------|---------------------------|---|--|
| 1.1 | Monitoring and other | 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. |

| | | | |
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| | core statutory duties | | <p>Throughout 2023, LBRUT maintained 2 x automatic stations monitoring NO2, PM10 and O3 and 65 x permanent NO2 diffusion tube sites borough wide.</p> <p>LBRuT now has funding to replace the stolen mobile air quality station with a static site in Richmond town centre late in 2024.</p> <p>LBRUT is part of the LAQN and values the work done by Imperial College to help achieve and maintain the highest possible standards.</p> <p>Bias adjusted annual results in ASR's are published asap online</p> |
| 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 | <p>Results are continually updated and made publicly available. Latest raw data is available quarterly online here</p> <p>The AQAP is updated regularly and meetings held with community groups to ensure transparency and to listen to ideas and concerns.</p> <p>Data is regularly provided for concerned residents and Cllrs on request.</p> |
| 1.3 | Monitoring and other core statutory duties | Continuous review and improvement of the Air Quality Network throughout the borough | <p>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. Throughout 2023, the Council ran approximately an additional 60 x diffusion tube sites per month to satisfy this demand.</p> |
| 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 | <p>Target: to support 4 projects including up to 150 additional diffusion tubes for locations borough wide.</p> <p>The Council exceeded its target; it installed in excess of 720 x additional NO2 diffusion tubes for 4 separate projects plus ad hoc hot spot monitoring in 2023.</p> <p>In 2023, 1 x project involved the comprehensive monitoring of schools for a full 12 months and 3 x projects involved proposed road schemes – 1 x proposed LTN in Hampton Hill, 1 x school on the extended ULEZ (East Sheen Primary School on the South Circular/ ULEZ which was extended on 29/8/23 and potential displacement traffic for the Royal Parks Movement strategy. Royal Parks have proposed to stop through traffic in Richmond and Bushy Parks. Potentially this could be harmful to health for those living on displacement routes such as the South Circular. The Council has therefore worked with Royal Parks to establish robust monitoring within both Parks and along displacement routes outside. Work is ongoing. In all cases data was provided and will continue to be provided to help inform decision-making. Work with East Sheen Primary</p> |

| | | | |
|-----|--|--|---|
| | | | <p>School has continued to help measure any effects of the extended ULEZ on 29/8/23. This was in response to concerns from parents and the head teacher.</p> <p>In 2023, the Council also maintained 20 x low cost Breathe London sensors when the Internet of Things project concluded. All are sited in High streets and near schools, some co-located with NO2 diffusion tubes</p> <p>The Breathe London real time sensor network has proved popular with residents and Cllrs providing real time indicative data showing expected diurnal peaks and troughs for both NO2 and PM2.5's..Results are available on the Breathe London website: https://www.breathelondon.org/</p> |
| 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 | <p>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 2023 are in Appendix C</p> <p>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. Both schools received additional monitoring in 2023 which confirmed significant reductions and compliance within the school grounds.</p> <p>Ad hoc air quality monitoring is offered to all schools and is regularly provided to help address concerns.</p> |
| 1.6 | Monitoring and other core statutory duties | Roll out monitoring to all schools in the borough to provide information | <p>Target: 12 monitoring sites per annum in Primary Schools.</p> <p>In 2021, following concerns from Cllrs and parents, 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 2023, the 2nd year of this programme, the Council monitored at 20 Primary and Secondary Schools for 12 months, for more robust data. This is in addition to 8 schools which are monitored as part of the permanent monitoring schedule or part of road scheme monitoring. Results for the schools monitored in 2023 are in appendix C.</p> |

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| | | | <p>In addition, hot spot monitoring for 1 month NO2 and hot spot PM10 and PM2.5 at any school that requests it, is always available.</p> <p>Annual monitoring continued throughout 2023 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.</p> |
| 1.7 | Monitoring and other core statutory duties | Implement a new interactive AQAP, which will be updated regularly to provide transparent and concise updates to measure our performance as a borough. Air quality data to be updated quarterly. | <p>Ongoing.</p> <p>AQAP was adopted by Cabinet on 10/3/20 and the AQAP is available on the Council website.</p> <p>Air quality data is now updated quarterly on the Council website here</p> <p>A new AQAP is due in 2025 but Members have requested that this be bought forward a year to support innovative and robust air quality policy in LBRuT.</p> |
| 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 | <p>Target: 1 or 2 new monitors per year to be tested. Various products under consideration</p> <p>In 2023 the Council provided in house funding for 20 x air quality sensors to continue real time "low cost" air quality monitoring of NO2 and PM2.5's borough wide. In 2023 this included 10 sites in town centres and 10 sites at another selection of Primary Schools. This followed on from the successful South London Partnership Defra funded project in 2022 for which LBRUT was a member.</p> <p>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 2023 to help pupils and residents better understand exposure on their walk to school, work or leisure activities.</p> <p>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.</p> |
| 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 | <p>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.</p> <p>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</p> |

| | | | |
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| | | areas of planning and ensure developers focus on air quality throughout the build and for the life of the development | <p>S106 payments wherever possible from developers as part of mitigation measures on major developments.</p> <p>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.</p> <p>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.</p> |
| 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 | <p>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.</p> <p>In 2023, as in 2022, 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% which is excellent. As time goes on, construction appear more aware of requirements. Continued inspection, however is considered very important.</p> <p>For NRMM details, see table K.</p> |
| 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. | <p>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.</p> <p>In 2023 EH investigated all complaints on smoke control.</p> <p>LBRUT is part of the Defra funded London Wood burning Project (LWBP) and a member of the GLA engagement group on wood burning. In Autumn/Winter 2023/4 Richmond with the LWBP raised awareness of the health impacts from internal solid fuel burning on radio, local billboards, backs of buses, on social media and on the Council website. This followed detailed research by Imperial College London in Autumn/Winter 2022/3 to evaluate all types of internal wood and</p> |

| | | | |
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| | | | <p>solid fuel burning, which involved monitoring inside and outside homes burning a variety of different fuels in various appliances. The resulting data informed the awareness campaign. More information is available here</p> <p>For the last 5 years, including 2023/4 Richmond communications team 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.</p> <p>In 2020, bonfires were banned on all Council allotments at all times.</p> |
| 2.4 | Emissions from developments and buildings | Promoting and delivering energy efficiency and energy supply retrofitting projects in workplaces and homes through EFL retrofit programs such as RE:FIT, RE:NEW and through borough carbon offset funds. | <p>The Climate Change team at LBRUT worked on many projects throughout 2023. Delivery of energy efficiency improvements for those on the lowest incomes and in the least energy efficient homes using central government funding through the Green Homes Grant which concluded in September 2023, with Phase 3 delivering improvements for 82 properties. This brought the total number of homes improved to 212 across the 3 phases of Green Homes Grant.</p> <p>Support for energy efficiency has come from the Council's Cost of Living programme, funding provided to SW Leap has so far resulted in 133 home visits with associated installations of small measures, and 24 home advice sessions. In addition, they have continued their programme of energy advice events, holding 33 events with local libraries, food banks and children's groups. Thinking Works funding has been extended this year to provide a handyman service to homes in Richmond via the WRAP service to have more impactful interventions, with a focus on securing warmth for homes. Richmond has delivered over £44,000 in interventions via the Warm Home Packs initiative to over 900 eligible residents in Richmond, providing them with energy efficient lightbulbs, draft proofing measures and radiator foils as well as enabling access to the services provided by SW Leap.</p> <p>Phases 4 and 5 of Solar Together London are now closed and there is no planned next phase. Phase 5 of Solar Together delivered solar panel installations at 86 properties.</p> <p>These interventions are essential to help towards achieving the ambitious target for London to be a zero carbon city by 2050.</p> |
| 2.5 | Emissions from developments and buildings | Reduced emissions from council operations, including from buildings, vehicles and all activities. | <p>Richmond's Scope 1 and 2 carbon emissions for 2022/23 were 1645 tCO₂e. The figure shows an overall decrease in emissions for 2022/23 compared to 2021/22 and the baseline levels in 2017/18. Total emissions decreased by 15.8% between 2021/22 and 2022/23, with a decrease of 76.8% since 2017/18. This includes a 41.5% reduction in scope 1 emissions, which reflects an equivalent reduction in gas consumption in Council buildings.</p> |

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| | | | <p>Progress has been made on the decarbonisation of Council buildings in 2023, with the impacts of work to improve energy efficiency and reduce gas use seen in the reduction of the organisational carbon emissions. Installation of a building management system and LED lighting at the Civic Centre has seen gas use reduce by a quarter and electricity use reduce by a third, while the installation of LED lighting has seen electricity use reduce by 30%</p> <p>.Work has started on the preparation for Phases 3 and 4 of the Decarbonisation Strategy, including the creation of a decarbonisation roadmap that will set out actions to reduce the Councils' emissions within the next few years, to achieve the Council's 2030 target of carbon neutrality.</p> <p>Over 2023, the Council has worked with consultants Cenex to develop a vehicle fleet decarbonisation transition plan. This work has produced analysis of the current vehicles in the Council's fleet, their usage and distances travelled, as well as when they are due to be replaced. This will be used to develop a plan for decarbonising the fleet, alongside the charging infrastructure needs. To support the future charging infrastructure needed, the Council has already developed a phase 1 options appraisal for electric charging points in operational buildings.</p> <p>LBRUT continues to reap the benefits from the installation of solar panels on the roof of the Civic Centre, the insulation of original windows in listed buildings, heat pumps and conditions set for contractor fleet through procurement.</p> <p>The Council fleet now consists of 1 x zero emission (EV), 1 x hybrid, 64 x Euro VI.</p> |
| 3.1 | Public health and awareness raising | <p>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 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</p> | <p>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, Asthma Awareness Day, Bike week, walk to school week, wood burning and more.</p> <p>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.</p> |
| 3.2 | Public health and awareness raising | <p>We will actively lead in important campaigns and initiatives that raise awareness within the borough, including clean air day, car free</p> | <p>LBRUT aim for at least 4 campaigns a year.</p> <p>For Clean Air Day on 15/06/23, 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</p> |

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| | | <p>day, airTEXT and idling action campaign events, as well as proactive measures such as the use of road closures and park-lets .</p> | <p>also had a Dr Bike stall for basic bike checks. In addition we held an idling action event and provided schools with free resources to promote active travel. Entertainers engaged with 2 x schools with school streets at arrival and departure to raise pupil’s awareness of air pollution. We encouraged local businesses to take-up some suggested ways to work with suppliers and employees to help reduce their contributions to local air pollution.</p> <p>For Car Free Day on 22/09/23 the Council again offered free play streets to residents and promoted play streets and active travel to residents and businesses via social media, Council website and Council e-letters. 31 x play streets were closed free of charge by the Council over the weekend of 23/24 Sept 2023. Mid 2023 we increased our electric cargo bike hire scheme from 3 to 9 locations which were promoted with pop-up events at schools to show-case the cargo-bikes and answer questions.</p> <p>We supported the Ask about Asthma campaign (11-17 Sept 2023), to raise awareness and understanding about children and young people’s asthma. We publicised the range of online events, podcasts and videos to schools and residents, both directly and via a social media campaign.</p> <p>In 2023, as a legacy of the Idling Action London project, we continued, in house, to deliver 11 x idling action events at hot spots and schools borough wide. The events engaged with a total of 764 drivers. We provided 2 x air quality workshops and 1 x assembly to Primary schools, engaging an estimated 132 KS2 pupils.</p> <p>In 2023, traffic wardens engaged with 10,484 drivers idling their engines and required switch off.</p> <p>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 2023. 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.</p> <p>In 2023 Church Street Twickenham remained closed to traffic 10am – midnight daily.</p> |
| 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 AQAP and the two large, well-attended Air Quality and Climate Change summits in Oct 2019. This put Air Quality and Climate Change |

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| | | | high on the political agenda and in 2023 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 | <p>In 2023 Public Health worked with Environmental Health in the delivery of the GLA Superzone Project related to Nelson Primary in Whitton, near a busy road with higher levels of air pollution. As part of this project grant funding was made available to install a green screen and fence panels to help reduce air pollution exposure for children in the playground. Further work was carried out working with children and parents to produce low pollution walking routes to and from school. In addition, a Breathe London node was installed outside the school to help inform the school of air pollution levels and episodes in real time. As part of the Superzone Project which started in August 2022, the Environmental Health Team carried out an air quality audit of the school in October leading to a number of recommendations which have been implemented. The Superzone Project was concluded in December 2023 with updates to the GLA Health Team.</p> <p>In 2023, 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”.</p> |
| 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 2023. |
| 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 AQAP. It meets once or twice a year, including in 2023, with useful presentations, updates and information from the Air Quality Team, who answer or investigate any questions or concerns raised. In addition, in November 2023, Richmond Air Quality team took part in an Air Quality and Climate Change presentation at the Kew Archives for several hundred local residents. Additional engagement will be facilitated from 2024 with a new shared post between Climate Change and Air Quality |
| 3.7 | Public health and awareness raising | We will increase the number of schools with accredited travel plans by 20% per year with an aim to have up to 90% of all schools covered by | LBRUT has a part time Travel Planning Officer to help schools draw up travel plans. LBRUT also encourage walking/cycling to school. LBRUT encourages all schools to sign up to the TfL Travel for Life accreditation scheme. In 21/22 academic year 43 (53%) schools had TfL STARS accredited STP's, and the same was achieved in 22/23 academic year. As resources have been prioritised elsewhere this number is likely to drop for 23/24 academic year. |

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| | | 2024. We will encourage all schools to join TfL STARS programme. | <p>All year 6 pupils receive cycling proficiency training before they leave for secondary school.</p> <p>LBRUT also helps schools introduce road safety schemes which has been a big priority for 22/23 and 23/24 academic year with engineers designing and/or consulting on around 8 school schemes.</p> |
| 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. | <p>We have banned bonfires on all borough allotments and may consider further restrictions.</p> <p>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.</p> <p>All residents are encouraged to compost green and organic waste, use the Council's weekly food waste and recycling services and fortnightly green waste collection or visit Townmead Rd Reuse and Recycling Centre.</p> |
| 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. | <p>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.</p> <p>Richmond Council is part of the Defra funded London Wood Burning Project which in Winter 2023 ran campaigns on radio, on billboards and on the back of buses to advise of health impacts and discourage solid fuel burning borough wide. This was informed by the detailed research results of Imperial College London the year before. More information is available here</p> <p>In addition, every year for the last 5 years, Richmond Council 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.</p> <p>An officer from LBRUT is on the GLA Wood burning Working Committee and attends all Defra seminars for updated enforcement. A new smoke control order, to bring vessels within scope is under consideration.</p> |

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| 3.11 | Public health and awareness raising | Audit all schools in areas of poor air quality and provide financial support for measures that tackle and reduce exposure to pollution | <p>Following on from the Mayor of London's school audit programme, which provided significant advice and funding for the 3 schools in areas of poorest air quality – St Stephens Primary School, East Sheen Primary School and Windham Nursery School, LBRUT has a target to offer an audit to all schools in areas of poorer air quality.</p> <p>The Air Quality team audit one school per term and so completed three audits in 2023 (2x primary schools and 1x secondary). Each school received a tailor-made report which included observations, monitoring results and a range of recommendations that aim to reduce exposure at and around the school site. The schools received support afterwards to help implement improvements such as installing a green screen or bicycle storage racks.</p> <p>Pupils are regularly exposed to higher levels of pollution on their journey to/from school than during their school day. For this reason LBRUT encourage all schools to focus on cleaner walking routes to school during each campaign, including Clean Air Day 2023. This is reinforced at our school air quality workshops and audits, as well as via our website.</p> |
| 4.1 | Delivery servicing and freight | Develop plans for business engagement, including optimising/greening deliveries, supply chain and waste removal | <p>.During 2023, the business development section of LBRUT commissioned Crew Energy to deliver energy advice to 13 organisations in LB Richmond and 15 organisations in LB Wandsworth . The aim was to provide helpful advice during the energy crisis and these organisations included a mix of SMEs; charities; churches ; libraries; theatres and sports clubs.</p> <p>We have commissioned Carbon Architecture to deliver a Greening Your Business Programme in both LB Richmond and LB Wandsworth. These programmes are designed to support 25 businesses in Richmond and 35 businesses in Wandsworth to become more sustainable, to reduce their carbon emissions and to help them to achieve Level 1 accreditation of the Green Mark . In parallel with this programme, we are also encouraging our local suppliers to adopt more sustainable business practices through our business support programme.</p> |
| 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 Dec 2024 |

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| | | | <p>By Dec 2023 LBRUT had 66 vehicles, 64 (97%) are Euro VI, 1 x hybrid (1.5%) and 1 x EV (1.5%)– zero emission. Issues regarding the installation of EVCP at the Council depot is delaying fleet upgrades.</p> <p>Contractors are incentivised to use clean fleet via procurement (see 7.3)</p> |
| 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). Further reductions have been made, such as along the A310 corridor and parts of Staines Rd, so that by Jan 2024 over 95% of LBRuT roads have 20mph speed limits. 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 | <p>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 and again in 2023. Any impact from speed alone is not possible to ascertain.</p> <p>Speed did reduce slightly 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.</p> |
| 6.3 | Localised solutions | Additional speed reduction measures at A310 Kingston Bridge to Twickenham, A305 Staines Road Corridor and A308 Hampton Court Corridor | <p>These three corridors - A310, A305 and A308 were identified for corridor studies and were taken forward in 2022/23.</p> <p>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 24, works were delayed due to delays in receiving materials. Initial feasibility work has been completed for Kingston Road however this is subject to future funding to take this forward to public consultation. The speed limit was also reduced to 20mph on the A310 corridor between Twickenham and Hampton in January 2024.</p> <p>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. The scheme for an offroad cycle route was consulted on in 22/23 however the proposal received significant</p> |

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| | | | <p>opposition and was not approved at Committee. The design needs to be reconsidered for future re-consultation.</p> <p>Staines Road did not receive funding sufficient for traffic calming the length of road in 22/23. However, consultation was undertaken in early 2023 for a parking proposal with safety improvements around junctions included. The double yellow lines were improved and implemented in 2023 along with a 20mph speed limit between Fifth and Sixth Cross Roads. In addition, a scheme was consulted on between Sixth Cross Road and Apex Corner for raised crossings, a new traffic island and a lower speed of 20mph. The lower limit was not support however approval was granted for improvements around the toucan crossing by Glebe Way and a new traffic island. The toucan works have been completed and the island is subject to funding in 24/25.</p> |
| 6.4 | Localised solutions | <p>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)</p> | <p>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 the extended ULEZ on 29/8/23 prompted fresh thinking.</p> <p>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 appointed a specialist engagement consultant to gather thoughts and opinions for directing the focus for the project. The Council are currently reengaging a consultant to help gather further up-to-date traffic data to inform next steps that will possibly include a trial scheme in Summer/Autumn 2024.</p> <p>Progress will be updated in the 2025 ASR.</p> |
| 6.5 | Localised solutions | <p>Focus our policies and Local Implementation Plan on prioritising cycling and walking in the borough</p> | <p>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 2025, subject to funding being secured.</p> <p>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 Spring 2024.</p> |

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| | | | <p>Works continue on the consideration of contraflow cycle lanes in the borough.</p> <p>Other measures introduced in 23/24 include new crossings outside Meadlands School in Ham, two zebra crossings on Park Road, Hampton Hill and Oak Avenue, Hampton and an enhanced junction treatment outside Twickenham Prep School in Hampton. As part of the Manor Road cycle scheme we have also implemented two pedestrian friendly junction treatments in conjunction with the cycle scheme.</p> <p>Work is underway for improved crossings and safer school zones in a number of locations in 24/25 including Kings Road (Richmond), Station Road (Barnes), Shacklegate Lane (Teddington) and Arragon Road (Twickenham). The target delivery date for these schemes is end 24/25.</p> |
| 6.6 | Localised solutions | Continuing the roll out of Electric Vehicle Charging in the borough. Target. of 400 EV charging points by 2025 | <p>Ongoing - ambition to exceed target. Target achieved in 2021. Ambition to achieve more.</p> <p>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</p> <p>A total of 819 public charging points (sockets) are available in LBRUT comprising 736 slow (lamp column) 78 fast (Source London) and 5 rapid (TfL). There were 399 lamp column chargers installed in 2023, part of a programme of 525 to be completed in 2024. Further OZEV funding has been secured for additional rollout in 2024/25.</p> <p>The Council is continuing to investigate options with private sector providers for further fast/rapid charger provision at no cost and is also planning a trial of cross-pavement solutions to enable people to use a home charger even if they do not have off-street parking.</p> |
| 6.7 | Localised solutions | Investing in Cycling Infrastructure in the borough - 1000 Cycle stands, 30 Cycle Hangers, 200+ Cycle Racks by 2023 | <p>The borough is working to rapidly expand its residential bike hangar programme, with 20 new units installed in 22/23 and 15 more installed in early 23/24. The programme provides secure cycle storage for residents that cannot easily store bicycles within their homes.</p> <p>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.</p> <p>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</p> |

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| | | | 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 | <p>Richmond Council is endeavouring to promote active travel to school, alongside improved safety and air quality.</p> <p>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 TAQ committee has approved it's being made permanent. 1 is still under consideration awaiting a school decision on accesses. As part of Phase 4, a further 5 schools are in the process of being considered and will go to public consultation soon (2 have already been consulted on - Heathfield Infants and Heathfield Junior).</p> <p>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 - we are currently trialling this new feature and will roll out a priority implementation plan going forward once the trial is over.</p> |
| 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 | <p>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.</p> <p>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</p> |
| 7.1 | Cleaner transport | We will commission a Diesel Levy options paper and impact baseline 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 | <p>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.</p> <p>Following the ULEZ expansion in August 2023, members have considered the option of introducing an emission-based charging system. At the last review of parking charges, the decision was made to set the new charges aimed at encouraging less car usage/ownership to</p> |

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| | | are implementing charges linked to vehicle emissions | increase the wider use of sustainable transport modes such as public transport, walking and cycling. An emission-based charging structure has not been taken forward at this time but it will remain under consideration for future reviews of parking charges |
| 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 | <p>This is a top political priority. In 2023, traffic wardens engaged with 10,484 drivers across LBRUT, warning drivers and requiring switch off. All drivers complied, so no FPNs were issued. This was the 5th year of CEO enforcement and a total of over 53,000 warnings have now been issued. This is far higher than many other London authorities.</p> <p>In 2023 the Council continued their own monthly in-house idling events, some with volunteers and Cllrs, largely around level crossings but also around schools and hotspots in response to complaints. LBRUT continued to promote its own pledge for engine idling for businesses and schools, encouraging all schools to pledge not to idle, in return for a large no idling banner. These are displayed as reminders to motorists on boundary fences. In 2023, LBRUT investigated all engine idling complaints, requested traffic wardens support where relevant and erected additional no idling signage where practical.</p> <p>Much work has also been carried out with TfL buses and black cabs outside Richmond and Twickenham stations and at Richmond bus garage, talking to drivers, talking to TfL and Idling Action events at these locations. Richmond is currently exploring the potential for a borough wide PSPO to help enforce anti idling.</p> |
| 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. 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 | <p>LBRuT continued to encourage working from home where practical in 2023 and will continue so to do. This will help reduce emissions from travelling to/from work.</p> <p>Throughout 2023 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.</p> <p>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 a shared cargo bike for staff and has become a corporate car club member. Parking is only provided for essential car users, usually for 2 days a week. Free</p> |

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| | | | 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 | <p>LBRUT introduced this policy in its AQAP in March 2020 to address a specific concern with idling ice cream vans and food vendors.</p> <p>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.</p> <p>By December 2023, all static sites for mobile food vendors with the exception of 2 sites on Hampton Court bridge, had plug in points. The last 2 electrical installations are proving problematical due to running cable within the structure of the bridge but it is hoped to resolve this with UKPN shortly.</p> |
| 7.6 | Cleaner transport | Support the development and use of 'Car Clubs' in new residential developments, by station interchanges and in town centres. | <p>Car clubs operate throughout the borough and are positively endorsed by the Council. They are required where relevant through planning condition (LBRUT's AQ SPD 2020 S92).</p> <p>In 2023, there were 66 car club bays available to the operators Enterprise Car Club and Zipcar; however, some were unoccupied for a large part of the year due to residual demand issues and delays in supply of new vehicles caused by the global shortage of parts affecting manufacturing, primarily microchips. The operators intend re-occupying vacant spaces as and when vehicles become available. With the addition of a new operator Co-Wheels in 2024 the total number of vehicles is expected to rise to 97. The council worked with Zipcar to launch the free-floating car club Zipcar Flex in the north of the borough from July 2021. In 2023 there were 32 vehicles available on average and since May more than 90% have been electric. On average throughout 2023 there were 1,115 active members per month, making around 2,700 trips each month.</p> |
| 7.7 | Cleaner transport | Tackle idling vehicles at schools as a priority | <p>Traffic wardens target schools at pick up time on a regular basis. This continued throughout 2023.</p> <p>In 2022/3, active travel plans were encouraged and 14 school streets became permanent, encouraging more walking, scootering and cycling. This was considered a better option than</p> |

| | | | targeting idling alone. However, traffic wardens and our Idling Action events, continued to regularly target roads around schools at collection time. | | | | | | | | | | | | | | | | |
|---------------------------|------------------------------|--|--|--------------|-------|---------------------------|------|---------------------------|------|--------------------------|------|--------------------------|------|-------------------------|------|-------------------------|------|--------------------------|------|
| | New projects for 2021 | | Updates | | | | | | | | | | | | | | | | |
| 7.8 | Cleaner transport | Participation in London E-scooter rental trial - June 2021 | <p>LBRUT is one of the participating boroughs in the TfL London e-scooter rental trials. Over the first trial period from June 2020 to 24 September 2023, 3,186,487 trips had been carried out by e-scooter across the London trial. The second phase of the trial began on 25 September and the trial has been extended to 31 May 2026.</p> <p>Not surprisingly hire of e-scooters is more popular summer to winter.</p> <p>Below is a breakdown for the e-scooter trip data (to the nearest 100) for Richmond in this period:</p> <table border="1"> <thead> <tr> <th>Trial period</th> <th>Trips</th> </tr> </thead> <tbody> <tr> <td>TP22 (16 Jan – 13 Feb 23)</td> <td>2015</td> </tr> <tr> <td>TP23 (14 Feb – 12 Mar 23)</td> <td>2041</td> </tr> <tr> <td>TP24 (13 Mar – 9 Apr 23)</td> <td>2049</td> </tr> <tr> <td>TP25 (10 Apr – 7 May 23)</td> <td>2387</td> </tr> <tr> <td>TP26 (8 May – 4 Jun 23)</td> <td>3337</td> </tr> <tr> <td>TP27 (5 Jun – 2 Jul 23)</td> <td>4119</td> </tr> <tr> <td>TP28 (3 Jul – 30 Jul 23)</td> <td>3776</td> </tr> </tbody> </table> | Trial period | Trips | TP22 (16 Jan – 13 Feb 23) | 2015 | TP23 (14 Feb – 12 Mar 23) | 2041 | TP24 (13 Mar – 9 Apr 23) | 2049 | TP25 (10 Apr – 7 May 23) | 2387 | TP26 (8 May – 4 Jun 23) | 3337 | TP27 (5 Jun – 2 Jul 23) | 4119 | TP28 (3 Jul – 30 Jul 23) | 3776 |
| Trial period | Trips | | | | | | | | | | | | | | | | | | |
| TP22 (16 Jan – 13 Feb 23) | 2015 | | | | | | | | | | | | | | | | | | |
| TP23 (14 Feb – 12 Mar 23) | 2041 | | | | | | | | | | | | | | | | | | |
| TP24 (13 Mar – 9 Apr 23) | 2049 | | | | | | | | | | | | | | | | | | |
| TP25 (10 Apr – 7 May 23) | 2387 | | | | | | | | | | | | | | | | | | |
| TP26 (8 May – 4 Jun 23) | 3337 | | | | | | | | | | | | | | | | | | |
| TP27 (5 Jun – 2 Jul 23) | 4119 | | | | | | | | | | | | | | | | | | |
| TP28 (3 Jul – 30 Jul 23) | 3776 | | | | | | | | | | | | | | | | | | |

| | | | | |
|--|--|--|--|------|
| | | | TP29 (31 Jul – 27 Aug 23) | 3509 |
| | | | TP30 (28 Aug – 24 Sep 23) | 3859 |
| | | | TRIAL PERIOD 2 (P2) starts 25 September 2023 | |
| | | | P2TP1 (25 Sep – 22 Oct 23) | 3113 |
| | | | P2TP2 (23 Oct – 19 Nov 23) | 2799 |
| | | | P2TP3 (20 Nov – 17 Dec 23) | 2990 |
| | | | P2TP4 (18 Dec – 14 Jan 24) | 2611 |
| | | | P2TP5 (15 Jan – 11 Feb 24) | 2921 |
| | | | P2TP6 (12 Feb – 10 Mar 24) | 2704 |
| | | | P2TP7 (11 Mar – 7 Apr 24) | 2388 |
| | | | For more details see https://tfl.gov.uk/corporate/publications-and-reports/electric-scooter-rental-trial | |

| | New projects for 2022 | | Updates |
|-------------|--|---|--|
| 1.9 | Monitoring and other core statutory duties | Further in house Investment in new monitoring equipment as new technology moves forward. This witnessed enhancement to the diffusion tube network and provided real time data | <p>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.</p> <p>The project funding came to an end in Dec 2022 but the Council managed to continue funding in house. It had to reduce the number of sensors to 20 but continued with real time air quality monitoring. This meant throughout 2023, all town centres and 10 schools had access to indicative, real time monitoring. 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.</p> |
| 7.9 | Cleaner transport | Cargo bike hire scheme | <p>A Cargo Bike hire scheme was launched in May 2022, with three cargo bikes delivered to host-organisations in East Sheen, Hampton and Teddington. The Council funds the purchase and maintenance of these bikes.</p> <p>In August 2023, the Council delivered an additional 6 cargo bikes to serve Twickenham, Richmond Town Centre, Ham, St Margaret's, Whitton and Kew. Richmond has the largest cargo bike hire network of this type in London. The bikes have been hired 549 times by 216 active members and have covered 2444km, including 1276km that would have been travelled using vehicles fuelled by diesel or petrol. This has helped reduce carbon emissions by over 200kg. The scheme is delivered in partnership with Peddle My Wheels.</p> |
| 7.10 | Cleaner transport | Dedicated parking bays for e-cargo bikes | <p>Progress is being made with the Council's plan to introduce dedicated parking bays for cargo bikes across the borough.</p> <p>In November 2021 the transport committee approved the designation of up to 25 cargo bike parking bays across Richmond. Officers secured funding and identified 10 locations where existing parking bays could be converted to dedicated cargo bike parking bays. Following discussions with ward councillors, officers are now finalising arrangements for local consultations and installation under an experimental traffic order for 12 months. Feedback will be monitored before a decision is made as to whether the bays are made permanent. The proposed locations expected to be installed in spring 2024 are as follows: Lowther Road, Wellesley Road, Stillingfleet Road, Winchester Road, Darell Road, Hartington Road, Windham</p> |

| | | | |
|-------------|-------------------------------------|---|---|
| | | | <p>Road, Worple Street, Carrington Road and Ashburnham Road. These are all close to Primary Schools.</p> <p>Updates will be given in the 2025 report.</p> |
| 6.10 | Localised solutions | Public realm improvements focused on enhancing pedestrian spaces | <p>Construction on the A310 Strawberry Vale started in January 2022 and continued throughout 2023, 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.</p> |
| 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. | <p>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.</p> <p>Throughout 2023, work has been ongoing and included Public Health involvement in the Clean Air Day campaign at Richmond Station on 15th June 2023 to raise awareness of the dangers of air pollution on health and wellbeing. Public Health have developed a MECC (making every contact count) learning module on air pollution and health intended for front line council, NHS and voluntary sector staff who engage with the public to help inform them of the dangers of air pollution on health. Due to some resource constraints, it was not possible to utilise the Public Health Bus to conduct outreach work. Further public engagement work is currently underway to inform a future communications and engagement plan to target vulnerable groups in the community in collaboration with SWLICS.</p> |
| | New projects for 2023 | | |
| 7.11 | Cleaner transport | Finalise Richmond Climate Risk Mapping, including vulnerability score for local areas and publish, and use the Richmond Climate Risk Mapping tool to identify vulnerable residents | <p>Climate Risk Mapping developed to show social vulnerabilities and environmental hazards, for all areas of the borough at a Local Super Output Area (LSOA) level. This includes data on air quality related risks. This map is available via DataRich https://www.datarich.info/climate-risk-map/</p> |

| | | | |
|------|-------------------------------------|--|--|
| 3.13 | Public health and awareness raising | Continue role in development and delivery of SWL ICS Green Plan and contribute to the NHS Green Plan | Representatives from Public Health and Climate Change and Sustainability teams are part of the South West London Integrated Care Board Change and Sustainability Group, which is directing joined up health work on sustainability and the NHS' net zero targets. They are also part of the Green Plan working group, the sub-group which is shaping the development and delivery of the actions in the SWL ICB Green Plan. This has included leading sessions on Air Quality and health linkages, as well as sharing best practice examples |
| 3.14 | Public health and awareness raising | Implement actions in the Public Health Climate Change Action plan | <p>The new Public Health Climate Change Action Plan was finalised in 2022/23. Several actions from this action plan have already been completed or are in progress, including:</p> <ul style="list-style-type: none"> • Training: the MECC (Making Every Contact Count) module on climate change and health was finalised in mid-2023 and presented at and shared with the Climate Change Public Health London Network, VCS networks and at the SWL ICB NHS Green Plan Delivery Group. • Communication and Engagement: a Public Health Engagement and Communications plan has been developed; climate change workshops have been delivered; climate change briefs for the community voluntary sector have been developed and circulated; the Council website has been updated with climate change and health information; and participated in Clean Air Day, Car Free Day, and the Big Green Week. • Adaptation: formation of heatwave and vulnerable population working group; drafting of the Heatwave Health Needs Impact Assessment report (in consultation); leading on Severe Weather Planning; and continuing to be a core member of the Borough Resilience Forum and the SSA Resilience Planning group and regularly contributes to corporate emergency plans. • Influencing strategies, policies and plans: contributed to the development of the Local Plan, Walking and Cycling Strategy, Prevention Framework, and GLA Super Zone Programme. • Public Health Divisional Management Team coversheet has been updated to include guidance and support to help Public Health officers identify links to their papers (policies, strategies, plans, procurements, commissioning plans and reports) to climate change and air quality. |

3. Planning Update and Other New Sources of Emissions

Table N. Planning requirements met by planning applications in London Borough of Richmond upon Thames in 2023

| Condition | Number |
|--|--|
| Number of planning applications where an air quality impact assessment was reviewed for air quality impacts | 24 |
| Number of planning applications required to monitor for construction dust | 6 |
| 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 | 24 (all 24 likely to install non combustion) |
| Number of developments where an AQ Neutral building and/or transport assessments undertaken | 24 |
| Number of developments where the AQ Neutral building and/or transport assessments not meeting the benchmark and so required to include additional mitigation | 6 |
| Number of planning applications with S106 agreements including other requirements to improve air quality | 5 |
| Number of planning applications with CIL payments that include a contribution to improve air quality | 0 |
| NRMM: Central Activity Zone, Canary Wharf and Opportunity Areas Number of conditions related to NRMM included. Number of developments registered and compliant. Number of audits | N/A |

| | |
|---|-----|
| % of sites unregistered prior to audit | |
| NRMM: Greater London (excluding Central Activity Zone, Canary Wharf and Opportunity Areas) | |
| Number of conditions related to NRMM included. | N/A |
| Number of developments registered and compliant. | |
| Number of audits | |
| % of sites unregistered prior to audit | |

NRMM is a standard planning condition applied to all major developments. All sites are requested to register on the [NRMM website](#) and all NRMM used on-site is compliant with Stage IV of the Directive and/or exemptions to the policy. In 2022 and again in 2023, 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 2023. 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 Guidance 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 2023, which have 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. District heat networks are flagged for larger developments but to date have proved inefficient, usually due to distance. Requirements are as per London Plan, which meant none could be refused on grounds of AQ in 2023, 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 2023 97% (64 vehicles) of LBRUT's fleet was latest Euro VI, 1.5% (1 x vehicle) ZEC - zero emission capable (hybrid) and 1.5% (1 x vehicle) was EV - zero emission.

Issues around the installation of EVCP at the Council depot have hampered fleet upgrades which are hoped to be resolved shortly. Updates will be provided in ASR 20025.

4.2 NRMM Enforcement Project

The London Borough of Richmond upon Thames continues to support the NRMM Enforcement project in 2023 – 24.

The standard wording for all major planning applications for NRMM is

“All Non-Road Mobile Machinery (NRMM) of net power of 37kW and up to and including 560kW used during the course of site preparation and construction phases shall comply with the emission standards set out in chapter 7 of the GLA’s supplementary planning guidance “Control of Dust and Emissions During Construction and Demolition” dated July 2014 (SPG), or subsequent guidance. Unless it complies with the standards set out in the SPG, no NRMM shall be on site, at any time, whether in use or not, without the prior written consent of the local planning authority. The developer shall keep an up to date list of all NRMM used during the demolition, site preparation and construction phases of the development on the online register at <https://nrmm.london/>.

All NRMM should be regularly serviced and service logs kept on site for inspection. Records should be kept on site which details proof of emission limits for all equipment. The development shall be constructed in accordance with the approved details. All sites will be inspected for compliance. “

This is provided by Environmental Health to the Planning Officer and is applied to all major planning applications by them.

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 2023. Regular calibration visits of between 2-4 weeks were maintained throughout 2023. 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 2022 onwards, overnight spans were not possible until Summer 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).

PM₁₀ 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 PM₁₀ concentration for both LBRuT's automatic monitoring sites for 2023 was 15ug/m³ for Castlenau and 12ug/m³ for Wetlands, achieving data capture rates of 98% and 63% respectively. Since Wetlands fell below the Defra required 75% data capture threshold "annualisation" of data was necessary. (This is in accordance with the procedure detailed in LLAQM Technical Guidance (TG19)). Details are in Appendix A Table P.

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 NO₂ along with other pollutants. Under the Directive, annual mean NO₂ concentration data derived from diffusion tube measurements must demonstrate an accuracy of ±25 % to enable comparison with the NO₂ air quality objectives of the Directive.

In order to ensure that NO₂ 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 NO₂ 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

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

- Performance in AIR NO₂ PT Scheme (September 2021 – October 2023)
- Summary of Precision Scores for 2021 – 2023

- UKAS schedule of accreditation (November 2023)

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 (September 2021 – October 2023).

Gradko demonstrated “satisfactory” laboratory performance in 2023 for 50% TEA in Acetone.

Details of the scheme can be found at: https://laqm.defra.gov.uk/wp-content/uploads/2022/07/LAQM-NO2-Performance-data_Up-to-June-2022_V2.1.pdf

Gradko participate in the AIR PT NO₂ 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 AR046 (September-October 2021), AR049 (January-February 2022), AR050 (May-June 2022), AR052 (Jul-Aug 2022), AR053 (Sept – Oct 2022), AR055 (Jan - Feb 2023), AR056 (May - June 2023), AR058 (July - Aug 2023), and AR059 (Sept - Oct 2023), 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 NO₂ PT rounds AR046, 49, 50, 52, 53, 55, 56, 58 and 59

The following table lists those UK laboratories undertaking LAQM activities that have participated in recent AIR NO₂ PT rounds and the percentage (%) of results submitted which were subsequently determined to be **satisfactory** based upon a z-score of $\leq \pm 2$ as defined above.

| AIR PT Round | AIR PT AR046 | AIR PT AR049 | AIR PT AR050 | AIR PT AR052 | AIR PT AR053 | AIR PT AR055 | AIR PT AR056 | AIR PT AR058 | AIR PT AR059 |
|---|--------------------------|-------------------------|-----------------|--------------------|--------------------------|-------------------------|-----------------|--------------------|--------------------------|
| Round conducted in the period | September – October 2021 | January – February 2022 | May – June 2022 | July – August 2022 | September – October 2022 | January – February 2023 | May – June 2023 | July – August 2023 | September – October 2023 |
| Aberdeen Scientific Services | 100 % | 100 % | 100 % | 100 % | 100 % | 0 % | 100 % | 100 % | 75 % |
| Cardiff Scientific Services | NR [3] | NR [3] | NR [3] | NR [3] | NR [3] | NR [3] | NR [3] | NR [3] | NR [3] |
| Edinburgh Scientific Services | 75 % | NR [2] | 50 % | 100 % | 100 % | 100 % | 75 % | 100 % | 50 % |
| SOCOTEC | 100 % [1] | 100 % [1] | 100 % [1] | 100 % [1] | 100 % [1] | 100 % [1] | 100 % [1] | 100 % [1] | 100 % [1] |
| Exova (formerly Clyde Analytical) | NR [3] | NR [3] | NR [3] | NR [3] | NR [3] | NR [3] | NR [3] | NR [3] | NR [3] |
| Glasgow Scientific Services | NR [2] | 100 % | 100 % | 100 % | 100 % | 100 % | 100 % | 100 % | 100 % |
| Gradko International | 100 % | 100 % | 100 % [1] | 100 % | 100 % | 100 % | 100 % | 100 % | 100 % |
| Kent Scientific Services | NR [3] | NR [3] | NR [3] | NR [3] | NR [3] | NR [3] | NR [3] | NR [3] | NR [3] |
| Kirklees MBC | NR [3] | NR [3] | NR [3] | NR [3] | NR [3] | NR [3] | NR [3] | NR [3] | NR [3] |
| Lambeth Scientific Services | 75 % | 50 % | 75 % | 100 % | 50 % | 0 % | 75 % | 50 % | 0 % |
| Milton Keynes Council | 100 % | 75 % | 100 % | 100 % | 100 % | 50 % | 75 % | 100 % | 100 % |
| Northampton Borough Council | NR [3] | NR [3] | NR [3] | NR [3] | NR [3] | NR [3] | NR [3] | NR [3] | NR [3] |
| Somerset Scientific Services | 100 % | 75 % | 100 % | 75 % | 100 % | 100 % | 75 % | 100 % | 100 % |
| South Yorkshire Air Quality Samplers | 100 % | NR [2] | NR [2] | NR [2] | NR [2] | NR [2] | NR [2] | NR [2] | NR [2] |
| Staffordshire County Council, Scientific Services | 100 % | 100 % | 100 % | 0 % | 100 % | 100 % | 100 % | 100 % | 100 % |
| Tayside Scientific Services (formerly Dundee CC) | 100 % | NR [2] | NR [2] | 100 % | 100 % | NR [2] | 100 % | NR [2] | NR [2] |
| West Yorkshire Analytical Services | NR [3] | NR [3] | 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.

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.

2021 - 2023 Summary of Precision Results for Nitrogen Dioxide Diffusion Tube Collocation Studies UK Laboratories including for Gradko Laboratory 50% TEA in Acetone

Precision Summary Table

| Diffusion Tube Preparation Method | 2021 Good | 2021 Bad | 2022 Good | 2022 Bad | 2023 Good | 2023 Bad |
|--|-----------|----------|-----------|----------|-----------|----------|
| Gradko, 50% TEA in Acetone | 16 | 0 | 16 | 0 | 14 | 0 |
| Gradko, 20% TEA in Water | 34 | 0 | 33 | 0 | 21 | 0 |
| ESG Didcot / SOCOTEC, 50% TEA in Acetone | 25 | 3 | 29 | 0 | 28 | 0 |
| ESG Didcot / SOCOTEC, 20% TEA in Water | 14 | 1 | 11 | 0 | 4 | 0 |
| Staffordshire Scientific Services | 15 | 1 | 13 | 0 | 11 | 0 |
| Glasgow Scientific Services | 2 | 5 | 3 | 3 | 1 | 0 |
| Edinburgh Scientific Services | 6 | 0 | 1 | 0 | 0 | 1 |
| Milton Keynes Council | 4 | 0 | 1 | 0 | 1 | 0 |
| Tayside Scientific Services | 1 | 0 | 1 | 0 | 1 | 0 |
| Lambeth Scientific Services | 8 | 1 | 6 | 4 | 3 | 0 |
| Aberdeen Scientific Services | 7 | 0 | 7 | 0 | 7 | 0 |
| South Yorkshire Air Quality Samplers | 1 | 0 | 0 | 0 | 0 | 0 |
| ESG Glasgow, 50% TEA in Acetone | 0 | 1 | 1 | 0 | 1 | 0 |
| ESG Glasgow, 20% TEA in Water | 0 | 1 | 1 | 0 | 1 | 0 |
| Somerset County Council | 11 | 0 | 14 | 0 | 4 | 0 |

In 2023 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.

Factor from Local Co-location Studies

Numerical results for this data are contained in the National Bias Adjustment Spreadsheet version 03/24

Numerical results for this data are contained in the National Bias Adjustment Spreadsheet version 03/24. In 2023, 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 14/15 participating local authorities, no participating local authorities were deemed to be 'bad'.

| Analysed By | Method | Year | Site Type | Local Authority | Length of Study (months) | Diffusion Tube Mean Conc. (Dm) ($\mu\text{g}/\text{m}^3$) | Automatic Monitor Mean Conc. (Cm) ($\mu\text{g}/\text{m}^3$) | Bias (B) | Tube Precision | Bias Adjustment Factor (A) (Cm/Dm) |
|-------------|--------------------|------|-----------|---|--------------------------|---|--|----------|----------------|------------------------------------|
| Gradko | 50% TEA in acetone | 2023 | UB | City Of London Corporation | 10 | 28 | 22 | 26.3% | G | 0.79 |
| Gradko | 50% TEA in acetone | 2023 | R | City Of London Corporation | 11 | 36 | 31 | 15.0% | G | 0.87 |
| Gradko | 50% TEA in acetone | 2023 | R | LB Newham | 12 | 27 | 21 | 28.0% | G | 0.78 |
| Gradko | 50% TEA in acetone | 2023 | SU | Redcar And Cleveland Borough Council | 12 | 14 | 10 | 48.0% | G | 0.68 |
| Gradko | 50% TEA in Acetone | 2023 | R | Sandwell Mbc | 12 | 33 | 26 | 27.6% | G | 0.78 |
| Gradko | 50% TEA in acetone | 2023 | UB | Sandwell Mbc | 11 | 21 | 18 | 15.8% | G | 0.86 |
| Gradko | 50% TEA in acetone | 2023 | R | Sandwell Mbc | 12 | 23 | 20 | 14.2% | S | 0.88 |
| Gradko | 50% TEA in Acetone | 2023 | UC | Falkirk Council | 12 | 33 | 29 | 14.9% | G | 0.87 |
| Gradko | 50% TEA in Acetone | 2023 | UB | Falkirk Council | 12 | 15 | 13 | 8.9% | G | 0.92 |
| Gradko | 50% TEA in acetone | 2023 | R | London Borough Of Lewisham | 11 | 33 | 27 | 22.7% | G | 0.82 |
| Gradko | 50% TEA in Acetone | 2023 | R | London Borough Of Merton | 12 | 37 | 31 | 18.5% | G | 0.84 |
| Gradko | 50% TEA in acetone | 2023 | KS | Marylebone Road intercomparison | 11 | 47 | 38 | 25.7% | G | 0.80 |
| Gradko | 50% TEA in acetone | 2023 | R | Royal Borough Of Windsor And Maidenhead | 11 | 27 | 23 | 21.6% | G | 0.82 |
| Gradko | 50% TEA in acetone | 2023 | R | Royal Borough Of Windsor And Maidenhead | 12 | 24 | 24 | 0.6% | G | 0.99 |

| | | | | | | | | | | |
|--------|--------------------|------|---|--|----|----|----|-------|-----|------|
| Gradko | 50% TEA in acetone | 2023 | R | London Borough Of Richmond Upon Thames | 11 | 18 | 16 | 15.6% | G | 0.86 |
| Gradko | 50% TEA in acetone | 2023 | | Overall Factor³ (15 studies) | | | | | Use | 0.83 |

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


Gradko is accredited by UKAS for the analysis of NO₂ diffusion tubes. It undertakes the analysis of the exposed diffusion tubes by ultra-violet spectrophotometry. The relevant test is shown below on the UKAS Schedule of Accreditation issued 10 November 2023.

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: 026 Issue date: 10 November 2023 | |
| | 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 | <u>Chemical Tests</u> Ammonia as ammonium (NH ₄ ⁺) Benzene Toluene Ethyl benzene Xylene Hydrogen chloride as chloride (Cl ⁻) Nitrogen dioxide as nitrite (NO ₂ ⁻) Sulphur dioxide as sulphate (SO ₄ ²⁻) Hydrogen fluoride as fluoride (F ⁻) Hydrogen sulphide Ozone as nitrate (NO ₃ ⁻) Nitrogen Dioxide as nitrite (NO ₂ ⁻) Sulphur dioxide as sulphate (SO ₄ ²⁻) Formaldehyde as formaldehyde-DNPH Volatile Organic Compounds including: Benzene Toluene Ethylbenzene p-Xylene o-Xylene | Documented In-House Methods GLM 8 by Ion Chromatography GLM 4 by Thermal Desorption/ FID Gas Chromatography GLM 3 by Ion Chromatography GLM 5 by Colorimetric determination (UV Spectrophotometry) GLM 2 by Ion Chromatography GLM 7 by Colorimetric determination (UV Spectrophotometry) GLM 1 by Ion Chromatography GLM 18 by HPLC GLM 13 by Thermal Desorption GC-Mass Spectrometry |

NO₂ diffusion tube analysis method

NO₂ 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). NO₂ 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 NO₂ 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 NO₂ 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 O for 2016 to 2023. 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 O.

. In 2016, 2020, 2021 and again in 2023 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, which is our preferred choice to give more relevant local bias adjusted results. 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 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, 2022 and 2023 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 sites instead of Wetlands (0.83 in 2020; 0.82 in 2021) due to poor data capture rate at Wetlands. In 2023 it was decided to use the local roadside adjustment factor of 0.86 for roadside and both background sites, instead of the national bias adjustment factor, although in reality the results compute the same using either local (0.86) or national (0.83) for these 2 x background sites. Data capture at Wetlands (RI2) was 82% in 2020 and 85% in 2021, 62% in 2022 and 47% in 2023, 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 2023, the Borough undertook co-location studies at two continuous NO₂ monitoring sites, with triplicate NO₂ diffusion tubes at the following the locations:

- **Richmond 1 Castelnau (site 23):** a roadside site, in Castlenau Library Barnes. In 2023, the annual means for the Castelnau diffusion tubes (N^o 23) was 16.4 µg m³; for the continuous site (RI1) it was 15.7 µg m³. The bias adjustment factor is **0.86**
- **Richmond 2 Barnes Wetlands (site 37):** a suburban background site. Unfortunately in 2023 Richmond 2 Barnes Wetlands, experienced equipment failures resulting in poor data capture which took the site below the Defra threshold of 90% data capture. For this reason the bias adjustment factor of **0.86** for Richmond 1 Castelnau was used to bias adjust the 2 x background diffusion tube sites.

All LBRUT data was completed and returned in time for the co-location questionnaire and is included in the database bias adjustment factors v 03/24.

Discussion of Choice of Factor to Use

Choice of bias adjustment factor was given very careful consideration.

The National bias adjustment factor for Gradko using 50% TEA in acetone for March 2023 (v03/24) was **0.83**. Every year we consider which bias adjustment factor is best to use. In 2023 it was decided to use **the Castlenau roadside site** which was **0.86** to bias adjust all roadside sites and also the 2 x background sites. This was because data capture for Castlenau was very good (97%) and Wetlands was poor

(47%) so fell below the 90% required by Defra so could not be used. These are local results for the local area. It was decided that local bias adjustment was both more conservative and more relevant for the local area than **the National bias adjustment factor** for Gradko which was **0.83**.

In reality, having calculated results at both background sites using both bias adjustment factors of 0.83 for the National bias adjustment factor and 0.86 for Castlenau the results were the same but this may not have been the case. We wish to neither under estimate or over report levels of NO2 in the borough. (see below).

Table O. Bias Adjustment Factor

| Year | Local or National | If Local, Version of National Spreadsheet | Adjustment Factor Roadside | Adjustment Factor Background |
|------|-------------------|---|----------------------------|------------------------------|
| 2023 | Local | 03/24 | 0.86 | 0.86 |
| 2022 | National | 03/23 | 0.82 | 0.82 |
| 2021 | Local | 03/22 | 0.87 | 0.83 |
| 2020 | Local | 03/21 | 0.91 | 0.83 |
| 2019 | Local | 03/20 | 0.9 | 0.99 |
| 2018 | National | 03/19 | 0.92 | 0.93 |
| 2017 | National | 03/18 | 0.97 | 1 |
| 2016 | Local | 03/17 | 0.98 | 1.08 |

A.3 Adjustments to the Ratified Monitoring Data

Short-term to Long-term Data Adjustment

It is not always possible to measure for a whole year to obtain an annual mean for a pollutant. Sometimes instrument faults or problems with data quality can also lead to missing data and a full year's measurements are not achieved. 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 not necessary at any non-automatic (diffusion tube) site in 2023, so Table P contains no results for NO2 diffusion tubes.

Due to equipment failure, the automatic site at Wetlands recorded 47% data capture for NO2 and 63% for PM10 for 2023. This site was therefore annualised on the LAQN website by selecting 4 compliant nearby automatic sites for both NO2 and PM10. The output results and location sites are listed below in Table P

The tool allows you to do this for any LondonAir measurement site. Simply select the measurement site and period that you wish to annualise and then select between two and four nearby background measurement sites to act as a reference for the annualisation. The tool matches available measurements from the site being annualised with measurements from each background site to produce a ratio. TG19 provides the following guidance on the choice of reference sites for the annualisation, "Identify two to four nearby, long-term, continuous monitoring sites... The data capture for each of these sites should be at least 85%. These sites should be background (Urban Background, Suburban or Rural) sites to avoid any very local effects that may occur at Urban Centre, Roadside or Kerbside sites, and should, wherever possible lie within a radius of about 50 miles." This annualisation tool only selects background sites with at least 85% data capture for the corresponding year for use in the calculation.

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

Annualisation of NO2 for Wetlands RI2 2023 (data capture 47%)

Original annual mean 13ug/m3 corrected by annualisation to 14.2 ug/m3

| Original Annual Mean | Annualisation Factor | Annualised Mean |
|----------------------|----------------------|-----------------|
| 13 | 1.093 | 14.2 |

| Background Site | Annual Mean | Period Mean | Ratio |
|--|-------------|-------------|-------|
| Bexley - Belvedere | 15.3 | 13.5 | 1.138 |
| Lewisham - Deptford | 16.5 | 14.5 | 1.137 |
| Windsor and Maidenhead - Aldebury Road | 11.7 | 10 | 1.162 |
| Wandsworth - Wandsworth Town Hall | 25.1 | 26.8 | 0.935 |

<https://www.londonair.org.uk/LondonAir/latools/Annualisation.aspx?sitecode=RI2&year=2023&species=no2>

Annualisation of PM10 for Wetlands RI2 2023 (data capture 63%)

Original annual mean 12ug/m3 which remained 12 ug/m3 after annualisation

| Original Annual Mean | Annualisation Factor | Annualised Mean |
|----------------------|----------------------|-----------------|
| 12 | 1.003 | 12 |

| Background Site | Annual Mean | Period Mean | Ratio |
|-------------------------------------|-------------|-------------|-------|
| Tower Hamlets - Jubilee Park | 13.4 | 13.4 | 1 |
| Lambeth - Streatham Green | 16.6 | 16.6 | 1 |
| Reigate and Banstead - Horley FIDAS | 13.1 | 13 | 1.009 |
| Southwark - Elephant and Castle | 12.8 | 12.7 | 1.003 |

<https://www.londonair.org.uk/LondonAir/latools/Annualisation.aspx?sitecode=R12&year=2023&species=dust>

NO₂ Fall off With Distance Calculations

Distance Adjustment

Where an exceedance is measured at a monitoring site which is not representative of public exposure, the procedure specified in LLAQM.TG(19) to estimate the concentration at the nearest receptor has been deployed.

Distance correction was completed for 7 locations where the annual mean was above 36µg m⁻³. Following distance correction 1 location exceeded 36ug/m³ at the receptor and 6 locations were below 36µg m⁻³ at the receptor³ which is within 10% of the AQS (Air Quality Standard).

Results are reported in **Table Q**.

NO₂ diffusion tube results have been adjusted to represent exposure at the nearest façade, where required by DEFRA. 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 NO₂ concentrations at a given point against known relationships between NO₂ 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 2023 as per LLAQM (TG19) guidance.

Table Q. NO₂ Fall off With Distance Calculations 2023 Monitored Annual Mean NO₂ compared to exposure at nearest façade (µg m⁻³)

| Diffusion Tube ID | Distance (m) | | Annual Mean Concentration (µg/ | | | Comment |
|-------------------|-------------------------|------------------|--------------------------------|------------|-----------------------|---|
| | Monitoring Site to Kerb | Receptor to Kerb | Bias Adjusted | Background | Predicted at Receptor | |
| 36 | 2.1 | 4.3 | 48.3 | 14.2 | 42.5 | <i>Predicted concentration at Receptor above AQS objective.</i> |
| 42 | 0.7 | 3.6 | 37.8 | 14.2 | 30.5 | |
| 43 | 0.7 | 2.3 | 36.4 | 14.2 | 31.4 | |
| 50 | 0.7 | 3.4 | 38.2 | 14.2 | 31.1 | |
| 52 | 2.0 | 4.1 | 36.4 | 14.2 | 32.7 | |
| 85 | 1.7 | 10.1 | 39.5 | 14.2 | 29.3 | |
| Rut 02 | 0.7 | 2.9 | 40.0 | 14.2 | 33.1 | |

Annualised mean of 4 x local back ground sites for NO2 for The Wetland Centre 2023

| Original Annual Mean | Annualisation Factor | Annualised Mean |
|----------------------|----------------------|-----------------|
| 13 | 1.093 | 14.2 |

| Background Site | Annual Mean | Period Mean | Ratio |
|--|-------------|-------------|-------|
| Bexley - Belvedere | 15.3 | 13.5 | 1.138 |
| Lewisham - Deptford | 16.5 | 14.5 | 1.137 |
| Windsor and Maidenhead - Aldebury Road | 11.7 | 10 | 1.162 |
| Wandsworth - Wandsworth Town Hall | 25.1 | 26.8 | 0.935 |

Appendix B Full Monthly Diffusion Tube Results for 2023

Table D. NO₂ 2023 Diffusion Tube Results (µg/m³)

| 2023 NO ₂ data | | | ug/m ³ monthly non bias adjusted results | | | | | | | | | | | | Annual Mean: Raw Data | Annual Mean: Annualised and Bias Adjusted 0.86 (local) | Annual Mean: Distance Corrected to Nearest Exposure |
|---------------------------|---------------|---------------|---|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|--------------------------|--|--|
| Site ID | X OS Grid Ref | Y OS Grid Ref | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | | | |
| 1 | 515824 | 168815 | 32.82 | 33.90 | 19.75 | 26.19 | 21.48 | 21.61 | 14.58 | 20.33 | 18.50 | 19.64 | 25.02 | 19.56 | 22.8 | 19.6 | |
| 2 | 513217 | 169746 | 28.95 | 28.95 | 23.12 | 20.23 | 14.34 | 17.90 | 17.09 | 18.41 | 21.91 | 23.97 | 25.69 | 18.35 | 21.6 | 18.6 | |
| 4 | 514607 | 171258 | 35.46 | 34.58 | 25.35 | 26.56 | 19.92 | 22.29 | 17.80 | 24.47 | 26.32 | 28.30 | 32.08 | 21.07 | 26.2 | 22.5 | |
| 7 | 515695 | 170983 | 38.89 | 41.36 | 28.12 | 33.44 | 29.80 | 25.01 | 17.43 | 27.12 | 28.20 | 32.37 | 29.18 | 25.58 | 29.7 | 25.5 | |
| 9 | 514846 | 172348 | 35.62 | 31.83 | 26.34 | 24.59 | 21.80 | 22.29 | 15.27 | 20.25 | 20.99 | 23.10 | 28.61 | 20.42 | 24.3 | 20.9 | |
| 10 | 513390 | 172233 | 38.95 | 33.41 | 30.31 | 28.85 | 22.25 | 26.84 | 21.66 | 27.25 | 26.98 | 26.10 | 28.53 | 30.98 | 28.5 | 24.5 | |
| 11 | 514136 | 173389 | 32.56 | 37.79 | 29.95 | 22.46 | 24.92 | 22.05 | 18.13 | 23.84 | 23.37 | 27.74 | 30.95 | 24.10 | 26.5 | 22.8 | |
| 12 | 512612 | 173439 | 32.52 | 35.89 | 29.25 | 28.32 | 26.82 | 25.38 | 18.66 | 23.10 | 24.58 | 27.86 | 30.19 | 20.81 | 26.9 | 23.2 | |
| 13 | 515228 | 174082 | 32.96 | 34.04 | 26.98 | 23.73 | 23.44 | 21.48 | 14.68 | 20.92 | 23.13 | 25.25 | 26.53 | 19.39 | 24.4 | 21 | |
| 15 | 517196 | 173933 | 30.64 | 34.27 | 20.98 | 19.82 | 19.61 | 20.91 | 13.92 | 20.77 | 23.48 | 25.01 | 26.85 | 16.72 | 22.7 | 19.6 | |
| 17 | 517822 | 174755 | 40.07 | 43.22 | 28.23 | 28.85 | 29.12 | 30.68 | 19.71 | 29.59 | 32.30 | 33.49 | 34.30 | 23.72 | 31.1 | 26.8 | |
| 18 | 518822 | 175590 | | 46.55 | 34.18 | 34.58 | 32.23 | 31.18 | 25.42 | 31.64 | 43.56 | | 36.90 | 32.39 | 34.9 | 30 | |
| 19 | 518643 | 176156 | 34.46 | 34.89 | 26.45 | 25.35 | 20.34 | 19.06 | 18.32 | 21.84 | 29.77 | 30.11 | 29.08 | 24.07 | 26.1 | 22.5 | |
| 20 | 519205 | 177221 | 38.55 | 46.45 | 37.87 | 36.32 | 36.00 | 35.39 | 26.65 | 33.44 | 34.70 | 34.20 | 33.54 | 28.69 | 35.2 | 30.2 | |
| 22 | 522853 | 177908 | 30.71 | 29.98 | 18.97 | 19.20 | 13.53 | 15.39 | 11.42 | 13.92 | 17.68 | 21.09 | 26.96 | 19.84 | 19.9 | 17.1 | |
| 23 | 522502 | 177166 | 28.59 | 28.10 | 20.39 | 18.84 | 15.64 | 15.05 | 10.91 | 13.20 | 17.94 | 20.17 | 23.73 | 16.08 | 19 | 16.4 | |
| 25 | 521199 | 175460 | 41.73 | 37.27 | 31.44 | 34.55 | 34.03 | 37.38 | 20.48 | 28.82 | 33.36 | 31.41 | 31.23 | 25.24 | 32.2 | 27.7 | |
| 26 | 519168 | 175055 | 40.63 | 35.40 | 29.89 | 32.00 | 26.51 | 27.62 | 23.76 | | 32.56 | 35.69 | 38.13 | 29.40 | 32 | 27.5 | |
| 28 | 519445 | 173991 | 22.63 | 18.79 | 12.25 | 13.24 | 9.55 | 10.01 | 6.89 | 10.78 | 10.71 | 13.80 | 15.06 | 10.33 | 12.8 | 11 | |
| 30 | 518022 | 173165 | 31.84 | 29.04 | 21.84 | 22.91 | 20.03 | | 14.71 | 17.27 | 22.37 | 20.99 | 24.06 | 14.93 | 21.8 | 18.8 | |
| 31 | 515434 | 174045 | 47.60 | 46.39 | 37.25 | 37.53 | 29.51 | 30.89 | 26.76 | 30.87 | 32.17 | 37.78 | 36.89 | | 35.8 | 30.8 | |
| 32 | 516226 | 173195 | 36.42 | 45.67 | 36.55 | 37.12 | 33.30 | 37.12 | 26.44 | 30.99 | 35.72 | 32.04 | 35.03 | 27.72 | 34.5 | 29.7 | |
| 33 | 515934 | 173126 | 30.54 | 38.86 | 28.43 | 31.20 | 36.78 | 33.97 | | 29.91 | 28.55 | 28.68 | 33.85 | 22.56 | 31.2 | 26.8 | |
| 35 | 517524 | 169583 | 35.33 | 33.60 | 25.27 | 22.97 | 16.87 | 21.12 | 20.55 | 21.89 | 29.65 | 27.96 | 31.06 | 25.25 | 26 | 22.3 | |
| 36 | 520540 | 175399 | 58.08 | 63.50 | 51.95 | 60.40 | 49.45 | 56.66 | 48.58 | 54.17 | 70.22 | 64.23 | 49.83 | 46.85 | 56.2 | 48.3 | 42.6 |
| 37 | 522993 | 176731 | 25.40 | 22.01 | 15.27 | 14.73 | 11.73 | 12.77 | 8.82 | 11.63 | 14.36 | 16.99 | 20.35 | 13.81 | 15.5 | 13.4 | |

| 2023 NO ₂ data | | | ug/m ³ monthly non bias adjusted results | | | | | | | | | | | | Annual Mean: Raw Data | Annual Mean: Annualised and Bias Adjusted 0.86 (local) | Annual Mean: Distance Corrected to Nearest Exposure |
|---------------------------|---------------|---------------|---|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|--------------------------|--|--|
| Site ID | X OS Grid Ref | Y OS Grid Ref | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | | | |
| 39 | 517516 | 174331 | 44.90 | 50.23 | 33.38 | 36.73 | 36.87 | 37.29 | 27.04 | 32.46 | 35.74 | 37.82 | 36.71 | 32.38 | 36.8 | 31.6 | |
| 40 | 514068 | 172435 | 40.19 | 36.32 | 28.43 | 27.29 | 21.68 | 27.10 | 19.65 | 23.18 | 22.11 | 26.12 | 27.16 | 22.26 | 26.8 | 23 | |
| 42 | 518080 | 175259 | 49.84 | 57.66 | 42.24 | 44.80 | 37.66 | 44.48 | 34.83 | 41.98 | 52.19 | 45.29 | 39.48 | 36.43 | 43.9 | 37.8 | 30.8 |
| 43 | 517759 | 174757 | 48.87 | 48.03 | 59.10 | 41.01 | 39.99 | 39.58 | 32.60 | 34.63 | 46.59 | 44.86 | 38.01 | 34.88 | 42.3 | 36.4 | 31.6 |
| 44 | 518489 | 175056 | 41.78 | 42.39 | 30.55 | 30.14 | 30.39 | 31.58 | 21.07 | 31.49 | 33.29 | 37.01 | 38.76 | 29.99 | 33.2 | 28.6 | |
| 45 | 516383 | 171154 | 34.48 | 31.24 | 25.30 | 22.42 | 16.04 | 20.02 | 15.85 | 20.13 | 22.73 | 25.27 | 27.75 | 18.16 | 23.3 | 20 | |
| 50 | 519922 | 175324 | 44.09 | 52.80 | 39.84 | 49.57 | 44.40 | 39.13 | 38.61 | 43.68 | 49.19 | 48.98 | 46.25 | 37.09 | 44.5 | 38.2 | 31.3 |
| 51 | 520492 | 175695 | 30.77 | 29.92 | 18.43 | 21.59 | 19.71 | 18.21 | 14.66 | 18.23 | 22.62 | 26.51 | 30.42 | 19.11 | 22.5 | 19.4 | |
| 52 | 519773 | 175795 | 53.21 | 56.15 | 46.79 | 44.13 | 38.24 | 38.09 | 33.57 | 38.66 | 43.41 | 38.43 | 39.58 | 37.44 | 42.3 | 36.4 | 32.8 |
| 54 | 519585 | 176492 | 40.17 | 37.25 | 26.43 | 28.35 | 25.53 | 27.74 | 19.57 | 24.08 | 31.22 | 32.98 | 32.55 | 27.20 | 29.4 | 25.3 | |
| 55 | 519793 | 176142 | 38.42 | 38.42 | 30.89 | 27.86 | 27.34 | 25.71 | 22.69 | 26.64 | 32.21 | 34.76 | 32.28 | 20.43 | 29.8 | 25.6 | |
| 56 | 516788 | 174519 | 32.80 | | 23.10 | 28.73 | 24.87 | 23.39 | 17.91 | 21.47 | 22.53 | 21.65 | 26.74 | 20.74 | 24 | 20.6 | |
| 57 | 513915 | 172899 | 39.77 | 39.81 | 26.96 | 24.84 | 22.88 | 25.73 | 18.82 | 24.55 | 23.81 | 26.87 | 30.68 | 19.09 | 27 | 23.2 | |
| 58 | 516039 | 173766 | 31.89 | 31.50 | 26.52 | 27.07 | 25.48 | 23.92 | 17.71 | 23.57 | 24.83 | 24.68 | 27.14 | 20.87 | 25.4 | 21.9 | |
| 62 | 521651 | 176430 | 42.45 | 41.81 | 21.98 | 28.62 | 25.40 | 24.04 | 17.68 | 23.05 | 30.21 | 28.03 | 32.61 | 22.37 | 28.2 | 24.2 | |
| 63 | 514188 | 173801 | 40.04 | 37.43 | 31.41 | 28.25 | 23.38 | 24.94 | 20.98 | 24.95 | 26.19 | 31.84 | 32.87 | 22.89 | 28.8 | 24.7 | |
| 64 | 514484 | 171251 | 43.91 | 44.22 | 30.15 | 31.43 | 30.84 | 29.50 | 24.61 | 26.76 | 30.75 | 32.22 | 35.03 | 25.47 | 32.1 | 27.6 | |
| 65 | 516339 | 173366 | 40.64 | 44.59 | 38.73 | | 30.57 | 33.85 | 27.25 | 30.99 | 35.12 | 35.86 | 34.89 | 34.25 | 35.2 | 30.2 | |
| 66 | 519060 | 177428 | 37.54 | 42.74 | 25.41 | 25.06 | 22.38 | 25.56 | 23.98 | 27.18 | 32.59 | 31.08 | 31.29 | 23.28 | 29 | 24.9 | |
| 67 | 518042 | 174095 | 35.49 | 33.44 | 25.35 | 23.12 | 19.16 | 19.24 | 15.04 | 18.97 | 21.49 | 21.65 | 29.00 | 23.21 | 23.8 | 20.4 | |
| 68 | 522415 | 176537 | 37.08 | 36.38 | 27.32 | 25.63 | 23.80 | 25.87 | 20.01 | 21.04 | 27.41 | 29.56 | 30.86 | 24.04 | 27.4 | 23.6 | |
| 69 | 513494 | 171729 | 30.24 | 34.43 | 22.59 | 22.55 | 18.35 | 19.10 | 12.23 | 19.29 | 23.92 | 23.06 | 29.66 | 17.24 | 22.7 | 19.5 | |
| 70 | 520465 | 175965 | 42.16 | 44.20 | 33.83 | 35.62 | 29.63 | 29.67 | 28.19 | 27.88 | 44.67 | 40.33 | 37.97 | 27.79 | 35.2 | 30.2 | |
| 71 | 516574 | 174456 | 43.18 | 44.96 | 41.43 | 40.83 | 37.72 | 40.63 | | 34.71 | 41.65 | 35.91 | 31.46 | 29.38 | 38.4 | 33 | |
| 72 | 516839 | 174238 | 34.65 | 36.00 | 31.81 | 22.63 | 21.87 | 22.75 | 19.07 | 24.46 | 29.34 | 29.98 | 32.05 | 21.14 | 27.1 | 23.3 | |
| 73 | 513722 | 172873 | 41.23 | 38.38 | 32.32 | 28.81 | 26.37 | 26.77 | 28.72 | 27.92 | 31.77 | | 36.28 | 24.17 | 31.2 | 26.8 | |
| 74 | 519856 | 175856 | 44.15 | 44.49 | 35.81 | 35.73 | | 38.69 | 28.94 | 29.04 | 41.59 | 37.89 | 33.53 | 27.56 | 36.1 | 31.1 | |
| 75 | 515459 | 171029 | 40.12 | 39.37 | 29.07 | 26.45 | 20.03 | 30.36 | 20.83 | 26.61 | 30.66 | 31.94 | 33.60 | 23.70 | 29.4 | 25.3 | |
| 76 | 516588 | 171357 | 31.91 | 34.44 | 23.56 | 20.62 | 24.75 | 29.18 | 20.71 | 25.24 | 28.60 | 28.87 | 32.69 | 22.25 | 26.9 | 23.1 | |
| 77 | 514705 | 172092 | 42.44 | 38.64 | 35.05 | 34.21 | 27.65 | 28.56 | 22.95 | 27.43 | 32.27 | 31.33 | 33.44 | 25.62 | 31.6 | 27.2 | |
| 79 | 514810 | 172041 | 37.28 | 35.00 | 26.79 | 29.69 | 26.94 | 25.43 | 18.39 | 23.27 | 23.79 | 26.66 | 30.71 | 20.02 | 27 | 23.2 | |
| 80 | 520538 | 175926 | 35.53 | 36.53 | 28.18 | 25.55 | 25.80 | 23.50 | 17.49 | 21.77 | 32.74 | 30.38 | 26.78 | 19.10 | 26.9 | 23.2 | |
| 81 | 519912 | 175939 | 48.64 | 44.90 | 36.06 | 31.47 | 31.57 | 39.43 | 31.39 | 29.00 | 42.45 | 39.39 | 39.16 | 33.46 | 37.2 | 32 | |
| 82 | 516060 | 173708 | 30.68 | 29.59 | 23.30 | 24.86 | 18.77 | 20.05 | 14.21 | 22.63 | 22.33 | 24.52 | 27.41 | 19.19 | 23.1 | 19.9 | |

| 2023 NO ₂ data | | | ug/m ³ monthly non bias adjusted results | | | | | | | | | | | | Annual Mean: | Annual Mean: Annualised and Bias Adjusted | Annual Mean: Distance Corrected to Nearest Exposure |
|---------------------------|---------------|---------------|---|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|--------------|---|---|
| Site ID | X OS Grid Ref | Y OS Grid Ref | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Raw Data | 0.86 (local) | |
| 83 | 513811 | 169510 | 40.41 | 35.69 | 33.08 | 37.16 | 32.93 | 33.11 | 24.80 | 30.91 | 30.80 | 32.54 | 32.89 | 20.53 | 32.1 | 27.6 | |
| 84 | 513872 | 169518 | 29.61 | 23.75 | 18.14 | 14.31 | 15.47 | 15.26 | 11.74 | 17.06 | 16.93 | 19.36 | 24.16 | 17.32 | 18.6 | 16 | |
| 85 | 517911 | 174737 | 48.86 | 53.56 | 46.62 | | 38.43 | 42.83 | 44.45 | 41.23 | 48.13 | 49.78 | | 45.55 | 45.9 | 39.5 | 29.7 |
| Rut 01 | 516415 | 173419 | 35.25 | 34.38 | 26.15 | 27.11 | 18.04 | 23.83 | 17.80 | 21.07 | 26.73 | 27.42 | 32.42 | 30.69 | 26.7 | 23 | |
| Rut 02 | 517917 | 174928 | 54.62 | 50.14 | 35.95 | 43.16 | 48.44 | 49.45 | 38.31 | 45.04 | 54.83 | 51.40 | 45.43 | 41.86 | 46.6 | 40 | 33.3 |

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 | Total | Annual mean |
|----------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|
| 23 | 30.96 | 26.87 | 20.39 | 19.34 | 15.18 | 15.71 | 11.59 | 13.40 | 18.48 | 21.74 | 23.21 | 18.52 | 235.39 | 21.40 |
| 23/2 | 27.93 | 28.93 | 20.20 | 18.60 | 15.16 | 15.21 | 11.27 | 13.50 | 18.26 | 19.51 | 24.56 | 15.52 | 228.65 | 19.05 |
| 23/3 | 26.88 | 28.50 | 19.64 | 18.56 | 16.57 | 14.23 | 9.86 | 12.69 | 17.09 | 19.25 | 23.41 | 14.21 | 220.90 | 18.41 |
| Average | 28.59 | 28.10 | 20.08 | 18.84 | 15.64 | 15.05 | 10.91 | 13.20 | 17.94 | 20.17 | 23.73 | 16.08 | 19.03 | 19.62 |
| 37 | 26.68 | 22.71 | 15.27 | 14.51 | 12.53 | 13.20 | 8.69 | 12.11 | 15.17 | 16.36 | 20.80 | 13.85 | 191.87 | 15.99 |
| 37/2 | 24.26 | 19.88 | 13.34 | 14.88 | 10.64 | 13.28 | 8.93 | 10.84 | 14.16 | 17.89 | 20.13 | 13.87 | 182.10 | 15.18 |
| 37/3 | 25.27 | 23.45 | 12.95 | 14.81 | 12.02 | 11.83 | 8.83 | 11.93 | 13.74 | 16.74 | 20.11 | 13.70 | 185.39 | 15.45 |
| Average | 25.40 | 22.01 | 13.85 | 14.73 | 11.73 | 12.77 | 8.82 | 11.63 | 14.36 | 16.99 | 20.35 | 13.81 | 15.54 | 15.54 |

- All erroneous data has been removed from the NO₂ diffusion tube dataset presented in Table D
- Annualisation has been conducted where data capture is <75% and >25% in line with LAQM.TG22
- Local bias adjustment factor used
- National bias adjustment factor used
- Where applicable, data has been distance corrected for relevant exposure in the final column
- London Borough of Richmond upon Thames confirm that all 2023 diffusion tube data has been uploaded to the Diffusion Tube Data Entry System.

Notes:

Exceedances of the NO₂ annual mean objective of 40µg/m³ are shown in **bold**.

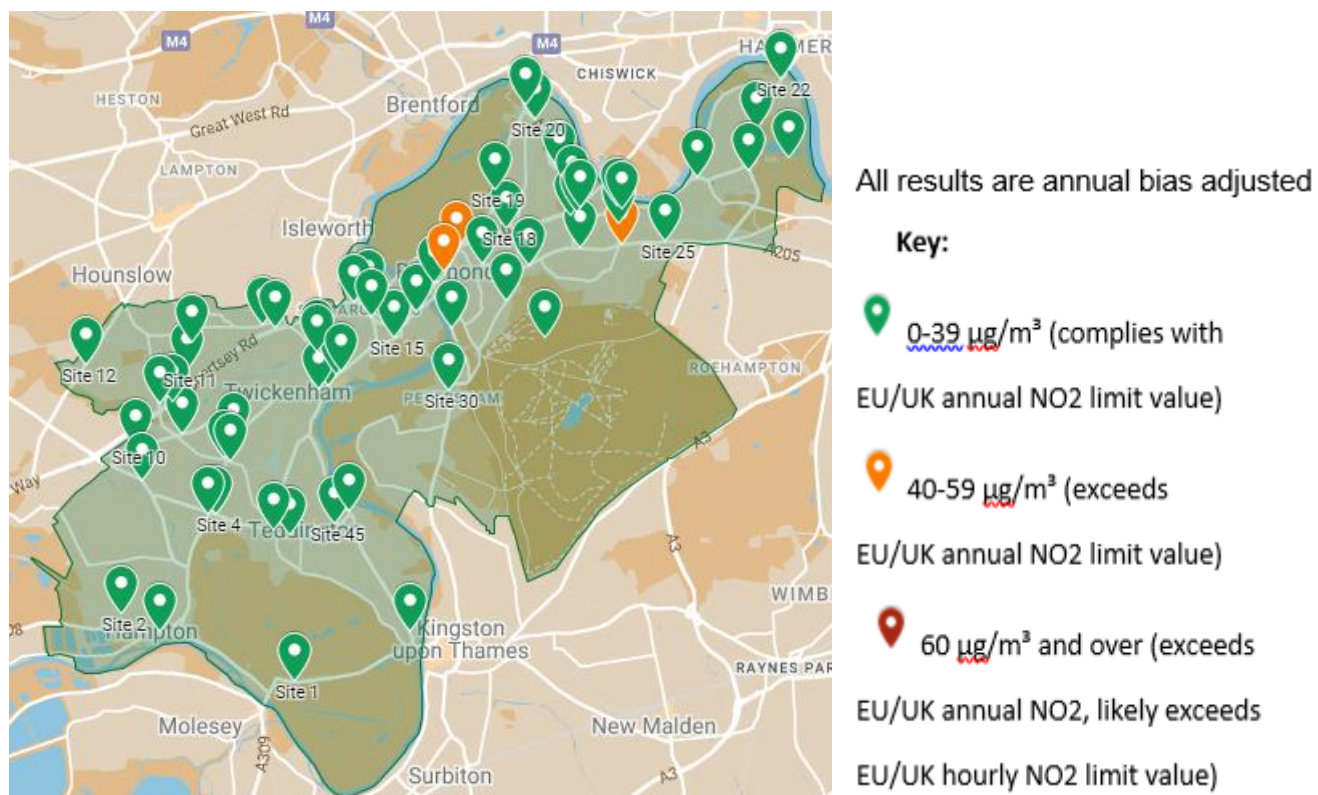
NO₂ annual means exceeding 60µg/m³, indicating a potential exceedance of the NO₂ 1-hour mean objective are shown in **bold and underlined**.

See Appendix C for details on bias adjustment and annualisation

Appendix C

Maps of Monitoring Locations and AQMA's

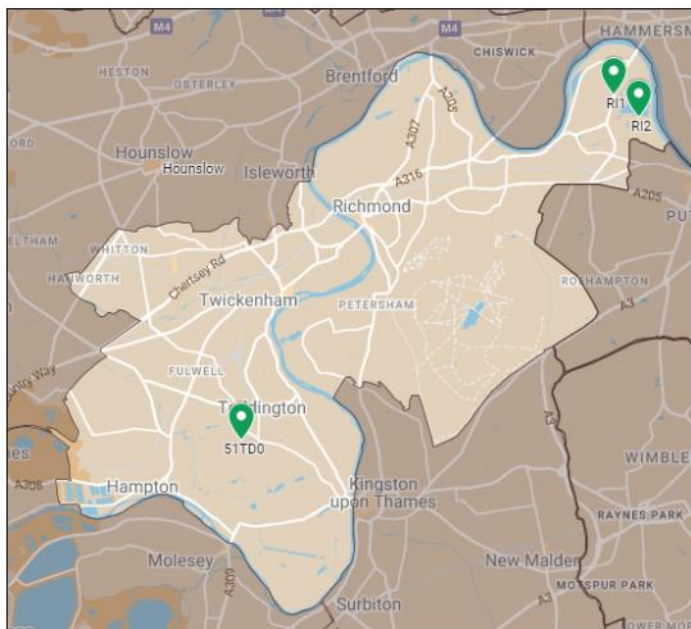
Figure A Map of Non-Automatic Monitoring Site(s) in LBRUT in 2023



<https://www.google.com/maps/d/viewer?mid=1FXi3kxJxhB-OJOYKU1JqQp-liTHfcCH5&ll=51.43908395006437%2C-0.33272889246094506&z=12>

Figure B

Map of Automatic Monitoring Site(s)– Castlenau, Wetlands in Barnes SW13 and NPL, Bushy Park, TW11 (see Table B for details).



London Borough of Richmond upon Thames has a whole borough AQMA, therefore either map of locations is the map for the AQMA

Appendix D

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 2023, the Council monitored at 18 x Primary Schools and 2 x Senior Schools. This is in addition to the 8 x schools monitored as part of the permanent monitoring schedule or part of additional proposed road schemes. All results for the schools monitored in 2023 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 lower, than those recorded outside on the pavement. Reductions in levels will vary, the difference can be slight or significant, depending on distance from major road and/or height and density of barrier. The results below indicate that levels within all 28 schools monitored in 2023 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.

| AQ monitoring for LBRUTNursery/Primary and Senior Schools | | NO ₂ (ug/m3) | | | | | | | | | | | | Castlenau | |
|---|---|-------------------------|---------|---------|-------|---------|---------|---------|---------|---------|---------|---------|-------|-------------|---------------|
| | | 2023 | | | | | | | | | | | | 0.86 | |
| Site ID | School | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Annual mean | Bias adjusted |
| Sch 16 | The Vineyard School, Friars Stile Rd, Richmond TW10 | 28.90 | 23.82 | 21.01 | 19.38 | 15.45 | 17.36 | 12.16 | 17.80 | 19.32 | 20.59 | 23.77 | 16.20 | 20 | 17 |
| Sch 17 | Orleans Primary School, Hartington Rd, TW1 | 25.78 | 24.28 | 15.19 | 13.64 | 12.67 | 11.43 | 7.64 | 11.60 | 12.88 | 15.61 | 20.32 | 11.13 | 15 | 13 |
| Sch 18 | St Richard Reynolds Catholic Prim School, TW1 | 29.87 | 25.83 | 19.46 | 15.93 | missing | 12.61 | 8.87 | 13.01 | 15.55 | 19.63 | missing | 14.19 | 17 | 15 |
| Sch 19 | Twick Prim Academy, 57 Colne Rd, Twick TW2 | 45.21 | missing | 29.41 | 30.92 | 30.51 | 28.10 | 23.07 | 28.60 | 33.10 | 34.66 | 34.12 | 21.72 | 31 | 27 |
| Sch 20 | Archdeacon Cambridge's CoFE Prim Sch, The Grn Twick | 30.21 | 28.25 | 20.19 | 18.35 | 15.33 | 15.30 | missing | missing | 16.37 | 18.02 | 23.00 | 13.63 | 20 | 17 |
| Sch 21 | Trafalgar Infant School, Meadway Twickenham | 26.67 | 26.76 | 17.87 | 15.36 | 12.90 | 13.43 | 9.65 | 12.66 | 16.47 | 17.11 | 22.14 | 12.14 | 17 | 15 |
| Sch 22 | Trafalgar Junior School, Elmsleigh Rd, Twick TW2 | 22.90 | 25.87 | 16.74 | 14.09 | 13.10 | 11.58 | 8.44 | 11.65 | 14.77 | 16.34 | 22.31 | 10.53 | 16 | 13 |
| Sch 23 | St James's RC Primary School, Stanley Rd, TW11 | 27.60 | 23.60 | 17.01 | 13.31 | 11.83 | 11.28 | 9.91 | 12.68 | 14.46 | 18.34 | 22.25 | 14.72 | 16 | 14 |
| Sch 24 | Stanley Primary School, Stanley Rd, TW11 | 29.96 | 28.97 | 21.47 | 18.82 | 17.34 | missing | 13.19 | 15.67 | missing | 19.10 | 27.16 | 16.71 | 21 | 18 |
| Sch 25 | St Mary's and St Peter's CoFE Prim Sch, Somerset Rd, TW11 | 28.33 | 26.06 | 15.59 | 15.11 | 12.06 | missing | 9.03 | 11.81 | 12.52 | missing | 19.91 | 11.71 | 16 | 14 |
| Sch 26 | Collis Primary School, Fairfax Rd, TW11 | 22.44 | 24.52 | 15.27 | 14.78 | 10.87 | 11.17 | 8.64 | 9.70 | 13.65 | 15.29 | 19.53 | 11.25 | 15 | 13 |
| Sch 27 | Sacred Heart RC Prim Schl, 40 St Mark's Rd, TW11 | 27.01 | 24.52 | 14.62 | 14.83 | 10.77 | 10.73 | 8.25 | 10.83 | missing | 13.38 | 20.78 | 13.11 | 15 | 13 |
| Sch 28 | Hampton Wick Inf & Nurs Schl, Normansfield Rd, TW11 | 23.29 | 21.84 | 13.26 | 12.78 | 9.79 | 11.30 | 8.25 | 10.42 | 11.97 | 14.78 | missing | 10.24 | 13 | 12 |
| Sch 29 | Teddington Scl, Broom Rd, Teddington TW11 9PJ | 26.42 | 24.34 | missing | 13.68 | 10.67 | missing | 7.98 | 11.15 | 13.36 | 15.82 | 20.41 | 12.68 | 16 | 13 |
| Sch 30 | St John the Baptist CoFE Jnr Sch, Lwr Tedd Rd, HW | 24.06 | 22.04 | 14.31 | 13.31 | 10.63 | 10.92 | 8.09 | 10.02 | 12.71 | 15.78 | 18.79 | 10.28 | 14 | 12 |
| Sch 31 | Heathfield Infant & Nurs Schl, Powdermill Rd, TW2 | 32.10 | 27.07 | missing | 20.04 | 14.91 | 15.06 | 11.55 | 15.35 | 19.99 | 23.20 | 25.71 | 17.78 | 20 | 17 |
| Sch 12 | Nelson Primary School, Nelson Rd TW2 | 31.98 | 30.33 | 16.55 | 21.79 | 17.91 | 18.20 | 13.25 | 16.21 | 19.21 | 23.96 | 26.10 | 18.87 | 21 | 18 |
| Sch 33 | St Edmund's Catholic Primary School, Nelson Rd, TW2 | 29.73 | 28.69 | 20.07 | 18.85 | 17.10 | 17.20 | 10.99 | missing | 18.25 | 21.00 | 24.19 | 15.88 | 20 | 17 |
| Sch 34 | Chase Bridge Primary School, Kneller Rd, TW2 | 33.72 | 33.39 | 23.03 | 24.36 | 22.29 | 22.15 | 13.13 | 18.31 | 22.35 | 23.34 | 28.90 | 17.67 | 24 | 20 |
| Sch 35 | Orleans Park School, Richmond Rd, Twickenham, TW1 | 33.70 | 29.71 | 23.06 | 22.48 | 23.69 | 21.75 | 16.03 | 18.46 | 21.07 | 23.15 | 23.45 | 18.71 | 23 | 20 |
| 105 | East Sheen Primary, URRW, SW14 | 41.51 | 37.79 | 39.02 | 42.34 | 33.13 | 42.87 | 38.11 | 37.30 | 41.11 | 42.84 | 37.86 | 28.07 | 38 | 33 |
| 71 | St Stephens Primary, Winchester Rd, TW1 (nr A316) | 43.18 | 44.96 | 41.43 | 40.83 | 37.72 | 40.63 | missing | 34.71 | 41.65 | 35.91 | 31.46 | 29.38 | 38 | 33 |
| 20 | Kings RC Primary, Cumberland Rd, TW9 3HJ | 38.55 | 46.45 | 37.87 | 36.32 | 36.00 | 35.39 | 26.65 | 33.44 | 34.70 | 34.20 | 33.54 | 28.69 | 35 | 30 |
| 84 | Christs School, Queens Rd, Richmond | 29.61 | 23.75 | 18.14 | 14.31 | 15.47 | 15.26 | 11.74 | 17.06 | 16.93 | 19.36 | 24.16 | 17.32 | 19 | 16 |
| 51 | Thomson Hse, Sheen Lane, SW14 | 30.77 | 29.92 | 18.43 | 21.59 | 19.71 | 18.21 | 14.66 | 18.23 | 22.62 | 26.51 | 30.42 | 19.11 | 23 | 19 |
| 30 | The Russell School, Petersham Rd, TW10 7AH | 31.84 | 29.04 | 21.84 | 22.91 | 20.03 | missing | 14.71 | 17.27 | 22.37 | 20.99 | 24.06 | 14.93 | 22 | 19 |
| 215 | Hampton Hill Jnr Schl, St James Ave, TW12 | 24.22 | 23.00 | 13.72 | 13.78 | 11.83 | 12.23 | 8.68 | 11.91 | 13.40 | 14.04 | missing | 12.24 | 14 | 12 |
| 243 | Kew Riverside Primary, Courtlands Ave, Rich TW9 | 35.74 | 37.24 | 23.44 | 28.57 | 21.69 | 24.25 | 21.25 | 24.62 | 29.03 | 28.85 | 30.72 | 22.37 | 27 | 23 |

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:

| |
|--|
| 0-20 µg/m ³ (complies with EU/UK annual NO ₂ limit value) |
| 0-40 µg/m ³ (complies with EU/UK annual NO ₂ limit value) |
| 40-60 µg/m ³ (exceeds EU/UK annual NO ₂ limit value) |
| over 60 µg/m ³ (exceeds EU/UK annual NO ₂ , likely exceeds EU/UK hourly NO ₂ limit value) |

| 2023 Air Quality hot spot PM10 monitoring for LBRuT Nursery, Primary & Senior Schools | | PM10 (ug/m ³) | | | | | | | | | | | |
|--|---|---------------------------|-------|------|------|-------|------|------|-----|------|------|------|------|
| | | 2023 | | | | | | | | | | | |
| Site ID | School | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
| Sch 16 | The Vineyard School, Friars Stile Rd, Richmond TW10 | 38.6 | 22.4 | 18.7 | 9.6 | 15.2 | 16.1 | 13.4 | 8.2 | 20.8 | 10.4 | 23.5 | 19.8 |
| Sch 17 | Orleans Primary School, Hartington Rd, TW1 | 31 | 20.7 | 19.5 | 12.3 | *26.6 | 19.8 | 9 | 8.1 | 19.5 | 6 | 24 | 19.2 |
| Sch 18 | St Richard Reynolds Catholic Prim School, TW1 | 32.9 | 19.3 | 12.6 | 12.6 | 13.3 | 14.5 | 9.6 | 8.1 | 19.4 | 7.6 | 21.8 | 18.9 |
| Sch 19 | Twick Prim Academy, 57 Colne Rd, Twick TW2 | 34 | 28.1 | 26 | 12.6 | 20.3 | 15.9 | 8.6 | 5.4 | 19.3 | 8.4 | 25.3 | 27.8 |
| Sch 20 | Archdeacon Cambridge's CofE Prim Sch, The Grn Twick | 37.6 | 18.4 | 18.9 | 12 | 16.5 | 18.8 | 8.7 | 7.3 | 20.1 | 10 | 28.4 | 26.8 |
| Sch 21 | Trafalgar Infant School, Meadway Twickenham | 34.9 | 16.5 | 14.2 | 13.9 | 16.2 | 15.6 | 7.4 | 6.8 | 19.3 | 7.2 | 28.8 | 24.3 |
| Sch 22 | Trafalgar Junior School, Elmsleigh Rd, Twick TW2 | 30.9 | 17 | 13.5 | 10.1 | 16 | 18.2 | 7.9 | 7.4 | 18.8 | 6.2 | 24.7 | 24.6 |
| Sch 23 | St James's RC Prim School, Stanley Rd, TW11 | 35.3 | 15.6 | 11.2 | 10 | 16.5 | 15.2 | 10.2 | 7 | 18.2 | 8.1 | 23.5 | 21.5 |
| Sch 24 | Stanley Primary School, Stanley Rd, TW11 | 33.2 | 20 | 12.7 | 8.5 | 18.2 | 13.8 | 9.2 | 6.9 | 19.9 | 9.6 | 24.2 | 20.7 |
| Sch 25 | St Mary's & St Peter's CofE Prim Sch, Somerset Rd, TW11 | 29.4 | 18.5 | 10.6 | 10.8 | 18.7 | 15.2 | 10.2 | *10 | 17.6 | 7.7 | 17.4 | 18.6 |
| Sch 26 | Collis Primary School, Fairfax Rd, TW11 | 32.1 | 17.7 | 10.3 | 11.9 | 17.4 | 14.8 | 8.2 | 7.7 | 17.7 | 8.2 | 18.8 | 17.4 |
| Sch 27 | Sacred Heart RC Prim Schl, 40 St Mark's Rd, TW11 | 28.8 | 15.7 | 7.8 | 11.5 | 17.1 | 13.8 | 9.1 | 5.3 | 14.3 | 8.6 | 16.9 | 15.6 |
| Sch 28 | Hampton Wic Inf & Nurs Schl, Normansfield Rd, TW11 | 29.1 | 17.4 | 10.6 | 11 | 18 | 21.5 | 9.7 | 7.3 | 15.2 | 8.5 | 27.8 | 18.2 |
| Sch 29 | Teddington Schl, Broom Rd, Teddington TW11 9PJ | 24.9 | 16.5 | 7.5 | 12.4 | 18.4 | 15.9 | 8.5 | 5.9 | 14 | 6.5 | 21.8 | 17.6 |
| Sch 30 | St John the Baptist CofE Jnr Sch, Lwr Tedd Rd, HW | 25.4 | 14.6 | 15.3 | 13.5 | 17.3 | 14.7 | 12.7 | 5.4 | 15.4 | 6.7 | 22.2 | 16.6 |
| Sch 31 | Heathfield Infant & Nurs Schl, Powdermill Rd, TW2 | 36.8 | 21.1 | 6.6 | 12.1 | 11.3 | 15.2 | 12.2 | 4.2 | 13.7 | 4 | 15.6 | 20.2 |
| Sch 12 | Nelson Primary School, Nelson Rd TW2 | 26.6 | 20.6 | 7.5 | 8.6 | 11.3 | 12.2 | 14.4 | 3.4 | 15.4 | 3.9 | 18.1 | 18.8 |
| Sch 33 | St Edmund's Catholic Primary School, Nelson Rd, TW2 | 25.6 | 20.2 | 6.9 | 8.9 | 13.5 | 12.9 | 14.9 | 3.8 | 12.4 | 4.9 | 21.1 | 18.7 |
| Sch 34 | Chase Bridge Primary School, Kneller Rd, TW2 | 27.5 | 26 | 7.9 | 12.5 | 14.2 | 13.8 | 12.7 | 4.8 | 15 | 4.2 | 21.2 | 17.8 |
| Sch 35 | Orleans Park School, Richmond Rd, Twickenham, TW1 | 35.4 | 22.4 | 24.5 | 15.6 | 15.8 | 18.7 | 14.1 | 9.5 | 20.2 | 8.8 | 23.6 | 22.6 |
| 105 | East Sheen Primary, URRW, SW14 | 37.4 | 49.6 | 32.3 | 19.5 | 20.2 | 18.1 | 15.3 | 7.8 | 25.8 | 10.8 | 46.2 | 37.6 |
| 71 | St Stephens Primary, Winchester Rd, TW1 | 32.8 | 30.6 | 26.2 | 15.8 | 16.6 | 16.8 | 14.8 | 6.4 | 23.4 | 7.8 | 28.7 | 31.7 |
| 20 | Kings RC Primary, Cumberland Rd, TW9 3HJ | 30.7 | 34.3 | 27.1 | 16.7 | 16.7 | 17.3 | 14.8 | 7.7 | 24.6 | 7.6 | 31.2 | 36.4 |
| 84 | Christs School, Queens Rd, Richmond | 28.6 | 19.8 | 17.8 | 14.2 | 15.6 | 14.2 | 13.8 | 7.1 | 18.3 | 9.2 | 20.5 | 19.6 |
| 51 | Thomson Hse, Sheen Lane, SW14 | 30.8 | 34.6 | 22.7 | 14.8 | 18.2 | 16.8 | 14.5 | 6.9 | 20.8 | 7.8 | 26.6 | 22.8 |
| 30 | The Russell School, Petersham Rd, TW10 7AH | 23.4 | 27 | 14.6 | 17.6 | 13.8 | 12 | 12.7 | 5.1 | 15.2 | 4.6 | 18.4 | 15.2 |
| 215 | Hampton Hill Jnr Schl, St James Ave, TW12 | 19.1 | 19.3 | 9.3 | 10.1 | 15 | 12 | 10.6 | 4.2 | 14.7 | 4.1 | 17.4 | 14.7 |
| 243 | Kew Riverside Primary, Courtlands Ave, Rich TW9 4ES | 30.3 | 31.40 | 22.7 | 13.4 | 18.8 | 16.3 | 13.1 | 7 | 18.6 | 8 | 23.8 | 19.5 |

Annual mean UK limit value PM10 = 40ug/m3; WHO guidelines =15ug/m3

| 2023 Air Quality hot spot PM2.5 monitoring for LBRuT Nursery, Primary & Senior Schools | | PM _{2.5} (ug/m ³) | | | | | | | | | | | |
|---|---|--|-------|-----|-----|-------|-----|-----|-----|------|-----|------|------|
| | | 2023 | | | | | | | | | | | |
| Site cod | School | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
| Sch 16 | The Vineyard School, Friars Stile Rd, Richmond TW10 | 3.6 | 9.4 | 4.8 | 4.8 | 5.7 | 6.8 | 4.3 | 3.1 | 10.7 | 3.1 | 6.5 | 9.5 |
| Sch 17 | Orleans Primary School, Hartington Rd, TW1 | 9.8 | 9.7 | 5.9 | 6.5 | *10.7 | 7.3 | 3.2 | 2.9 | 9.3 | 2.5 | 8.1 | 9.7 |
| Sch 18 | St Richard Reynolds Catholic Prim School, TW1 | 10.9 | 9 | 4.7 | 6.2 | 7.2 | 6.7 | 3.5 | 3 | 9.8 | 2.6 | 8 | 8.9 |
| Sch 19 | Twick Prim Academy, 57 Colne Rd, Twick TW2 | 11.6 | 8.4 | 4.3 | 5.9 | 7.4 | 6.9 | 4.2 | 3 | 10.7 | 3.3 | 8.8 | 9 |
| Sch 20 | Archdeacon Cambridge's CofE Prim Sch, The Grn Twick | 10.1 | 7.8 | 3.6 | 5.3 | 8.4 | 7.3 | 4.1 | 2.8 | 9.3 | 2.7 | 7.5 | 8.9 |
| Sch 21 | Trafalgar Infant School, Meadway Twickenham | 9.2 | 8 | 4.1 | 6.4 | 8.5 | 7.5 | 3.3 | 2.9 | 9.2 | 2.8 | 8.4 | 7.9 |
| Sch 22 | Trafalgar Junior School, Elmsleigh Rd, Twick TW2 | 13.4 | 7.6 | 4.5 | 5.2 | 8.5 | 7.4 | 3.5 | 3.2 | 9.4 | 2.3 | 8.4 | 7.5 |
| Sch 23 | St James's RC Prim School, Stanley Rd, TW11 | 11.3 | 7.4 | 3.6 | 5.4 | 7.7 | 6.6 | 3.8 | 2.7 | 8.4 | 2.9 | 7.1 | 7.3 |
| Sch 24 | Stanley Primary School, Stanley Rd, TW11 | 10.9 | 7.9 | 3.8 | 5 | 8 | 6.5 | 3.4 | 2.5 | 8.6 | 3 | 7.6 | 7.6 |
| Sch 25 | St Mary's and St Peter's CofE Prim Sch, Somerset Rd, TW11 | 11.5 | 8.2 | 4 | 5.9 | 7.4 | 7.2 | 3.8 | 3 | 7.4 | 2.9 | 6.2 | 8.1 |
| Sch 26 | Collis Primary School, Fairfax Rd, TW11 | 10.5 | 7.9 | 3.6 | 5.8 | 5.5 | 6.1 | 4 | 2.5 | 6.4 | 3.1 | 6.4 | 7.5 |
| Sch 27 | Sacred Heart RC Prim Schl, 40 St Mark's Rd, TW11 | 10.8 | 7.4 | 3.7 | 5.5 | 6.1 | 6.1 | 3.6 | 2.5 | 6.6 | 2.5 | 6.5 | 7.2 |
| Sch 28 | Hampton Wick Inf & Nurs Schl, Normansfield Rd, TW11 | 9.9 | 7.4 | 3.2 | 5.6 | 6.2 | 5.9 | 3.8 | 2 | 7.2 | 2.6 | 5.2 | 7.2 |
| Sch 29 | Teddington Schl, Broom Rd, Teddington TW11 9PJ | 10.6 | 8 | 2.9 | 5.8 | 5.6 | 5.6 | 4.1 | 1.9 | 6 | 2.7 | 6.1 | 7.9 |
| Sch 30 | St John the Baptist CofE Jnr Sch, Lwr Tedd Rd, HW | 8.9 | 7.3 | 3.8 | 5.9 | 6.4 | 5.5 | 4.4 | 1.7 | 6.2 | 2.5 | 6.6 | 6.9 |
| Sch 31 | Heathfield Infant & Nurs Schl, Powdermill Rd, TW2 | 11.7 | 9.9 | 2.6 | 5.3 | 4.8 | 5.2 | 5.6 | 1.7 | 4.3 | 1.8 | 5.9 | 9.1 |
| Sch 12 | Nelson Primary School, Nelson Rd TW2 | 10.1 | 7.8 | 2.5 | 4.8 | 4.6 | 5.5 | 5.7 | 1.6 | 3.7 | 1.7 | 6.3 | 7.3 |
| Sch 33 | St Edmund's Catholic Primary School, Nelson Rd, TW2 | 9.6 | 8.9 | 2.3 | 5.1 | 4.7 | 5.4 | 5.6 | 1.6 | 3.9 | 1.6 | 7.6 | 7.2 |
| Sch 34 | Chase Bridge Primary School, Kneller Rd, TW2 | 9.5 | 8.7 | 2.5 | 5.6 | 5.2 | 4.6 | 5.9 | 2.3 | 3.6 | 1.9 | 6.7 | 7.3 |
| Sch 35 | Orleans Park School, Richmond Rd, Twickenham, TW1 | 9.4 | 9.7 | 4.8 | 6 | 6.6 | 6.6 | 4.9 | 3.1 | 10.3 | 2.9 | 8.4 | 9.4 |
| 105 | East Sheen Primary, URRW, SW14 | 10.1 | 14.2 | 5.1 | 8.8 | 8.6 | 6.5 | 6 | 2.6 | 9.1 | 3 | 14.1 | 12.6 |
| 71 | St Stephens Primary, Winchester Rd, TW1 | 9.8 | 9.6 | 4.4 | 7.2 | 7.2 | 5.6 | 5.9 | 2.3 | 7.3 | 2.9 | 9.3 | 10.1 |
| 20 | Kings RC Primary, Cumberland Rd, TW9 3HJ | 10 | 10.7 | 4.1 | 7.4 | 7.3 | 6.1 | 5.9 | 2.3 | 8.2 | 2.8 | 10.4 | 9.7 |
| 84 | Christ's School, Queens Rd, Richmond | 9.4 | 8.4 | 3.8 | 7.1 | 5.4 | 5.4 | 5.6 | 2.4 | 8.2 | 2.9 | 8.1 | 7.5 |
| 51 | Thomson Hse, Sheen Lane, SW14 | 9.4 | 9.8 | 4.2 | 7.3 | 7 | 5.3 | 5.6 | 2.3 | 7.8 | 2.7 | 9.1 | 8.8 |
| 30 | The Russell School, Petersham Rd, TW10 7AH | 8.7 | 10.4 | 3.8 | 7.2 | 5.1 | 4.6 | 4.4 | 3.4 | 7.1 | 1.9 | 7.6 | 7.4 |
| 215 | Hampton Hill Jnr Schl, St James Ave, TW12 | 6.2 | 8.2 | 3.2 | 5 | 5.2 | 5.3 | 4.9 | 1.8 | 5 | 1.2 | 7.9 | 6.3 |
| 243 | Kew Riverside Primary, Courtlands Ave, Rich TW9 4ES | 9.3 | 10.20 | 4.8 | 7.3 | 5.7 | 5.8 | 3.1 | 2.7 | 7.8 | 2.9 | 9.9 | 10.2 |

Annual mean UK limit value: PM_{2.5} = 20ug/m³; London Mayoral objective = 10ug/m³; WHO guidelines = 5ug/m³

Appendix E

Indicative PM_{2.5} monitoring by Breathe London nodes borough wide in 2022 and 2023

