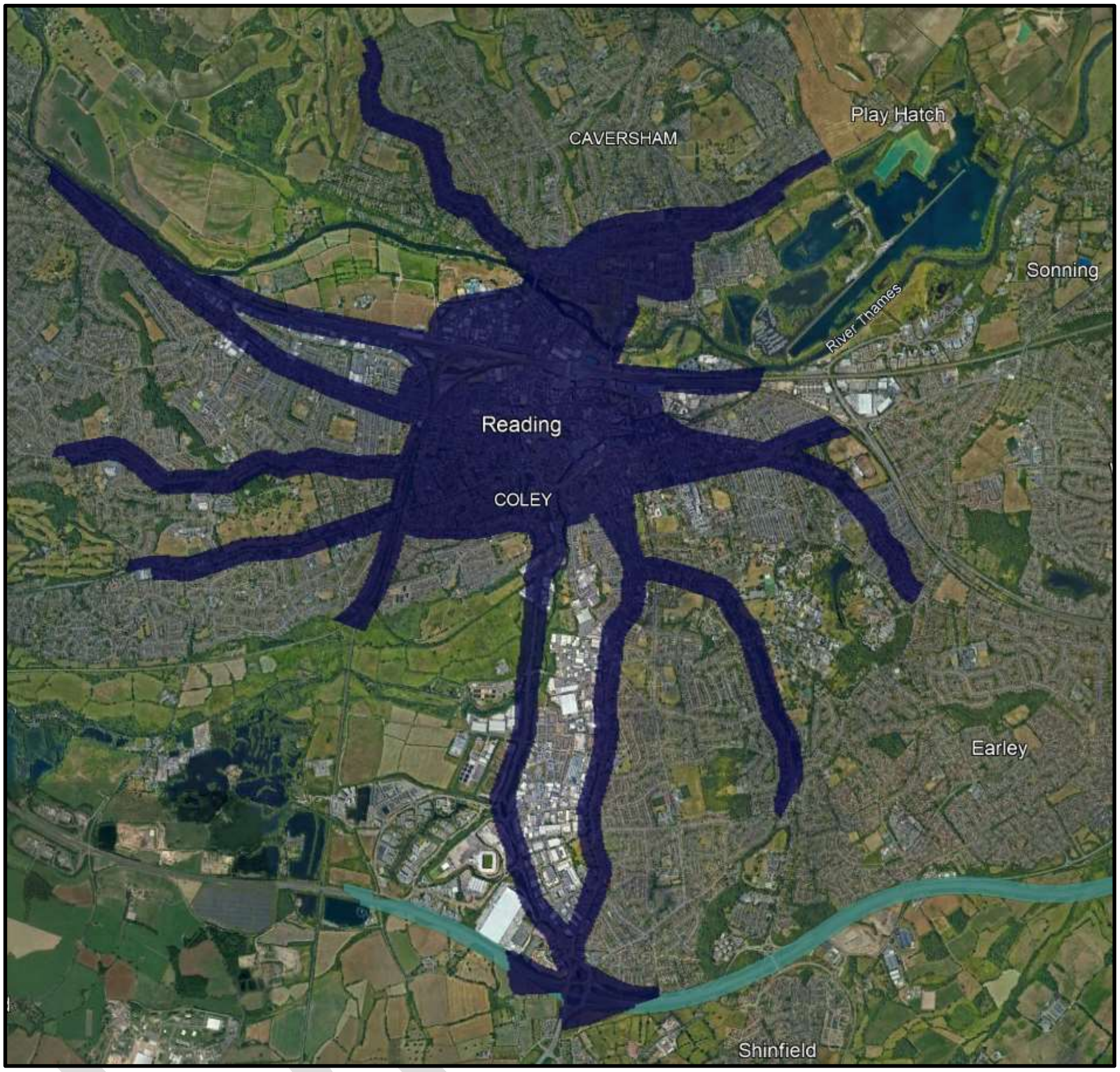
Summary of Current Air Quality in Reading

Please refer to the latest ASR from Reading Borough Council for full details of air quality monitoring and information.

1.1 Reading Air Quality Management Area

The current Reading Air Quality Management Area (AQMA), shown in Figure 1, extends out from the central Inner Distribution Road (IDR) zone along the main arterial roads and along some rail routes passing through Reading. The AQMA was declared due to exceedances of the annual mean UK Air Quality Strategy (AQS) Objective for nitrogen dioxide (NO_2) in 2009. Full details of the UK's air quality standards and objectives are provided in Appendix C, for reference.

Figure 1 – Reading Air Quality Management Area



© Google Earth imagery.

1.2 Air Quality Monitoring

Reading Borough Council monitors for NO_2, particulates with diameters of 10 microns or less (PM_{10}), particulates with diameters of 2.5 microns or less ($PM_{2.5}$) and ozone (O_3) at a number of locations across the borough.

There are four automatic air quality monitoring stations (AQMS) in Reading [monitoring pollutants]:

- Reading AURN[4] Urban Background AQMS [NO_2; PM_{10}; $PM_{2.5}$; O_3]
- RD1 Roadside AQMS [NO_2; PM_{10}]
- RD3 Roadside AQMS [NO_2; PM_{10}]
- RD4 Roadside AQMS [NO_2; PM_{10}]

Reading also has a network of non-automatic NO_2 diffusion tubes monitoring concentrations at 56 locations. The majority of monitoring locations in Reading are at the roadside, with only 1 site at an urban background location (the Reading AURN AQMS).

1.2.1 2019 and 2022 Monitoring Results

Due to the influence of the Covid-19 lockdowns during 2020/21, baseline air quality information presented in this AQAP is based on pre-Covid-19 data from 2019, and post-Covid-19 data from 2022.

Monitoring results from the 2020 ASR for NO_2, covering the 2019 data period, saw the number of non-compliant locations reduce to 5 from 15 locations (in 2018), with regard to the annual mean air quality objective (AQO). The data also identified a further 8 sites that were within 10% of the AQO risk threshold.

The key locations of non-compliance/ elevated concentrations in 2019 were:

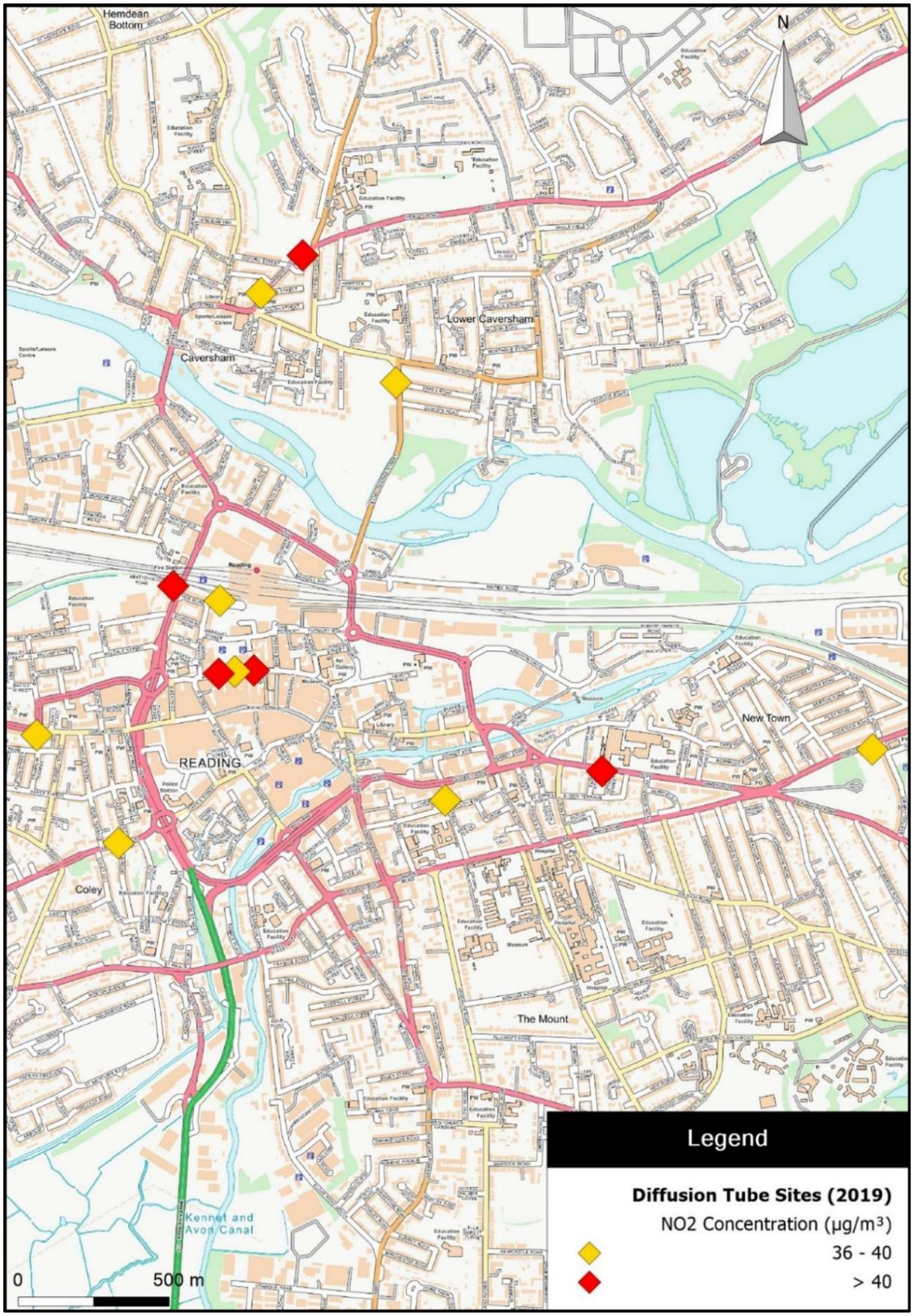
- London Road
- Castle Hill
- Caversham Road/ A329
- Caversham Road (A4155)
- Kings Road
- Prospect Street
- George Street
- Oxford Road
- Station Hill and Friar Street

[4] AURN – Automatic Urban and Rural Network AQMS operated by Defra.

No locations were in exceedance of the NO_2 1-hour mean AQO and there were no exceedances of any AQOs for PM_{10}. There was no exceedance of the 20 µg/m³ $PM_{2.5}$ annual mean concentration target limit either.

Figure 2, below, displays the locations of diffusion tubes which were at least within 10% of the annual mean AQO for NO_2 in 2019.

Figure 2 – Locations where NO_2 concentrations were above 36 µg/m^3 in 2019.



Note: An additional site, DT 24 on Oxford Road to the west, was also within 10% of the AQO.

Monitoring results from the 2023 ASR for NO_2, covering the 2022 data period, saw the number of non-compliant locations reduce to just 1 from the 5 locations in 2019, with regard to the annual mean air quality objective (AQO). The data also identified a further 3 diffusion tube sites that were within 10% of the AQO risk threshold.

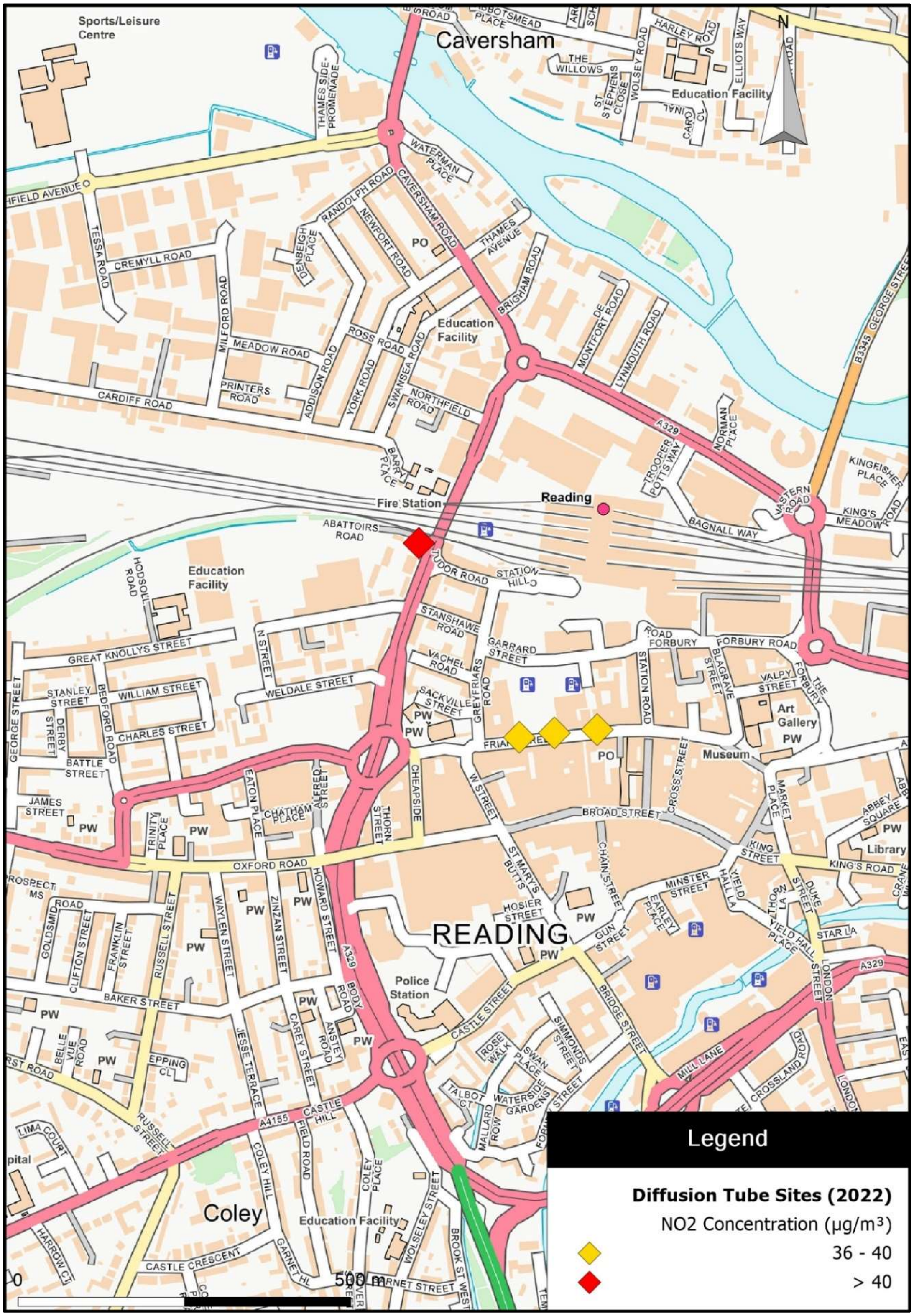
The key locations of non-compliance/ elevated concentrations in 2022 were:

- Caversham Road/ A329
- Friar Street

No locations were in exceedance of the NO_2 1-hour mean AQO and there were no exceedances of any AQOs for PM_{10}. There was no exceedance of the 20 µg/m³ $PM_{2.5}$ annual mean concentration target limit either.

Figure 3, below, displays the locations of diffusion tubes which were at least within 10% of the annual mean AQO for NO_2 in 2022.

Figure 3 – Locations where NO_2 concentrations were above 36 µg/m^3 in 2022.



1.2.2 Long term air quality trends in Reading

The Influence of Covid-19

The reduction in annual mean NO_2 exceedance areas between 2019 and 2022, as displayed in Figure 2 and **Figure 3**, suggests that air quality in Reading has improved over time.

It is acknowledged that the Covid-19 lockdowns and tiered restrictions impacted on our way of life and day to day activities, including; how and where we travelled, business operations, leisure activities and reduced use of public transport systems.

The associated lockdown periods showed how traffic influenced local pollution levels and signalled the level of reductions that could drive toward improved air quality. During the Covid-19 lockdown, levels of NO_2 dropped by between 20-30% across the country[5] – primarily from a significant reduction in private vehicle use.

It is difficult to anticipate what the future impact on local and national pollutant emissions are likely to be in the wake of the pandemic. However, it is quite probable that 2022 represents the first year of a post pandemic era – a “new normal”. This AQAP shall be continually reviewed and will be updated, if necessary, as more post-pandemic data is gathered in the future.

Figure 4, below, shows monthly mean NO_2 concentrations at Reading’s AURN urban background monitoring site, between 2017 and 2022. The data have been de-seasonalised and de-weathered using software packages available in *R* (v 4.3.1)[6] and *Openair*[7], to reduce the influence of seasonal variability and meteorology on the

[5] The Air Quality Expert Group (AQEG) issued a rapid review in June 2020 on the estimation of changes in air pollution emissions, concentrations, and exposure during the COVID-19 outbreak in the UK. The document acknowledges that there is some evidence to suggest that nitrogen dioxide (NO2), particulate matter (PM) and ozone (O3) may increase susceptibility to respiratory infections or worsen disease prognosis, although it recognises that there are still insufficient studies or mixed evidence for specific combinations of endpoints, infection types, age groups or pollutants.

[6] R Core Team (2023). _R: A Language and Environment for Statistical Computing_. R Foundation for Statistical Computing, Vienna, Austria. <https://www.R-project.org/>.

[7] Carslaw, DC. and Ropkins, K. (2012). Openair – an R package for air quality data analysis.

time series data. The subsequent trends seen in the data, after normalisation, better correlate with how air quality has actually changed over time.

Figure 4 – De-seasonalised monthly mean NO_2 concentrations at Reading's AURN monitoring site.

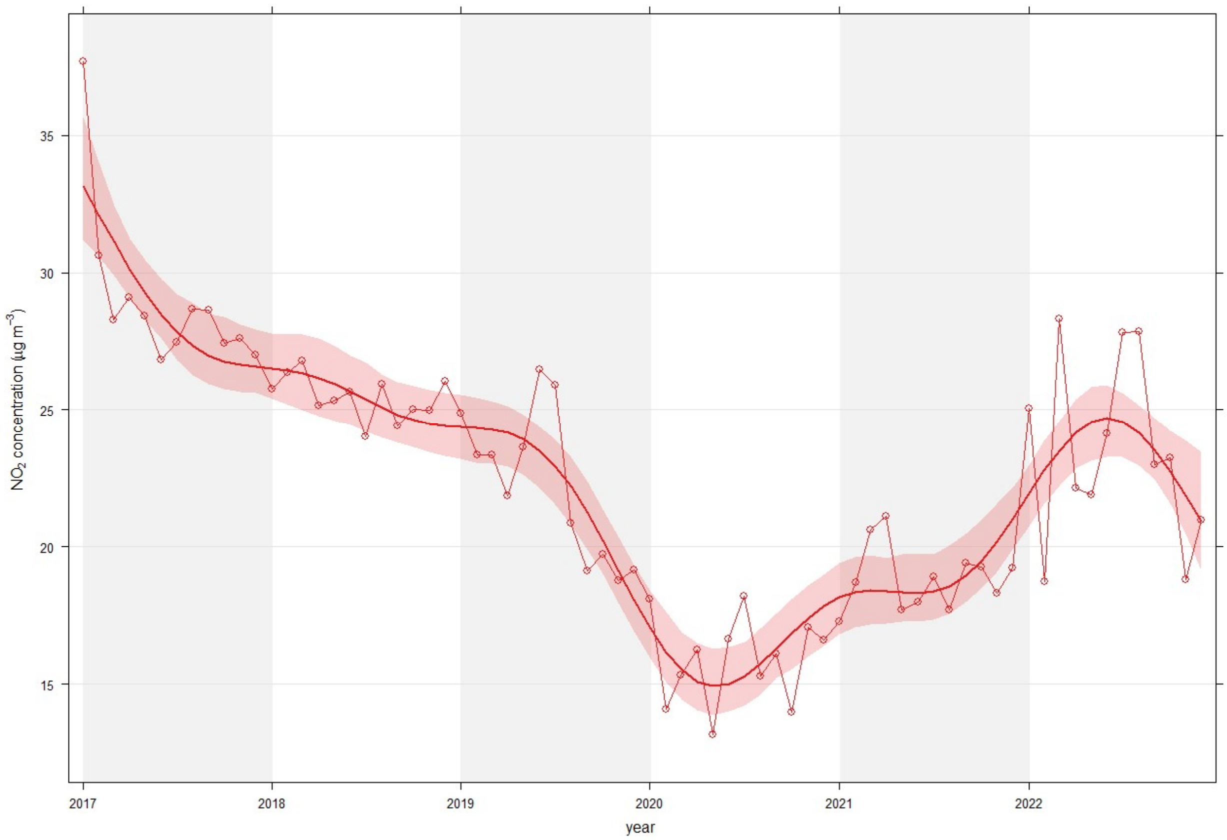


Figure 4 very clearly shows the influence of the Covid-19 pandemic on local air quality. The main local source of pollution within Reading is road transport emissions, and a Covid-19 study[8] undertaken on behalf of the Council strongly suggested that the key cause of this air quality improvement was the reduction in vehicle trips on the local road network.

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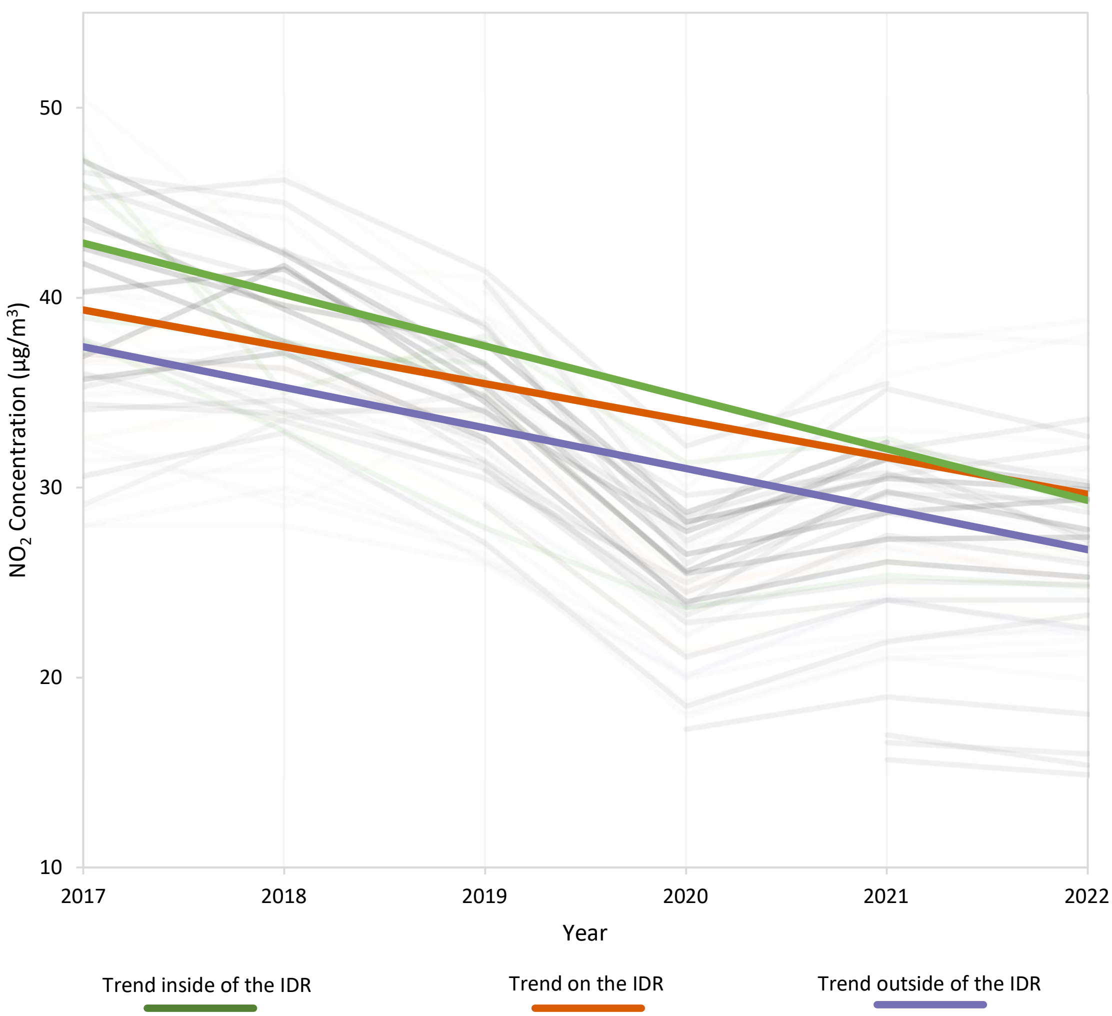
[8] Reading Borough Council and Phlorum Limited. (2020). Reading AQAP-Covid Data Review

Barring the brief plateau in NO_2 concentrations at the time of the 2021 winter lockdown, concentrations have since increased to near pre-pandemic levels, likely due to the return of vehicles on the local road network.

NO_2 trends within and outside of Reading's IDR

Figure 5, below, displays trends in NO_2 concentrations at all of Reading's roadside monitoring sites (both AQMSs and diffusion tubes) between 2017 and 2022. Three coloured trendlines are also presented, representing the average (mean) trends for the monitoring sites in, on and outside of the IDR – these trendlines exclude monitoring data from 2020 and 2021, to limit the influence of the Covid-19 pandemic on the observed trends.

Figure 5 – Trends in NO_2 concentrations at Reading's monitoring sites.



Evidently, air quality has improved significantly since 2017 with regards to NO_2, even after discounting the influence of the pandemic on air quality trends.

The greatest rate of improvement has occurred at monitoring sites within the IDR, in Reading's Town Centre. In 2017, the highest NO_2 concentrations were identified in central Reading, but since then, concentrations have reduced at an average (mean) rate of 2.7 µg/m³ per year.

Concentrations outside of the IDR have consistently remained below those identified in central Reading, improving at an average rate of 2.1 µg/m³ per year.

At the few monitoring sites located directly on the IDR, NO_2 concentrations have been improving since 2017, but at a slower rate of approximately 1.9 µg/m³ per year. Because of this, in 2022, annual mean roadside concentrations appear to be worse on the IDR than elsewhere in Reading, on average.

Long-term trends in Particulate Matter concentrations

The above data solely discusses trends with regards to NO_2, the pollutant for which Reading's AQMA was declared. However, increasing pressure is being placed on local authorities to consider how to manage particulate emissions within their boroughs.

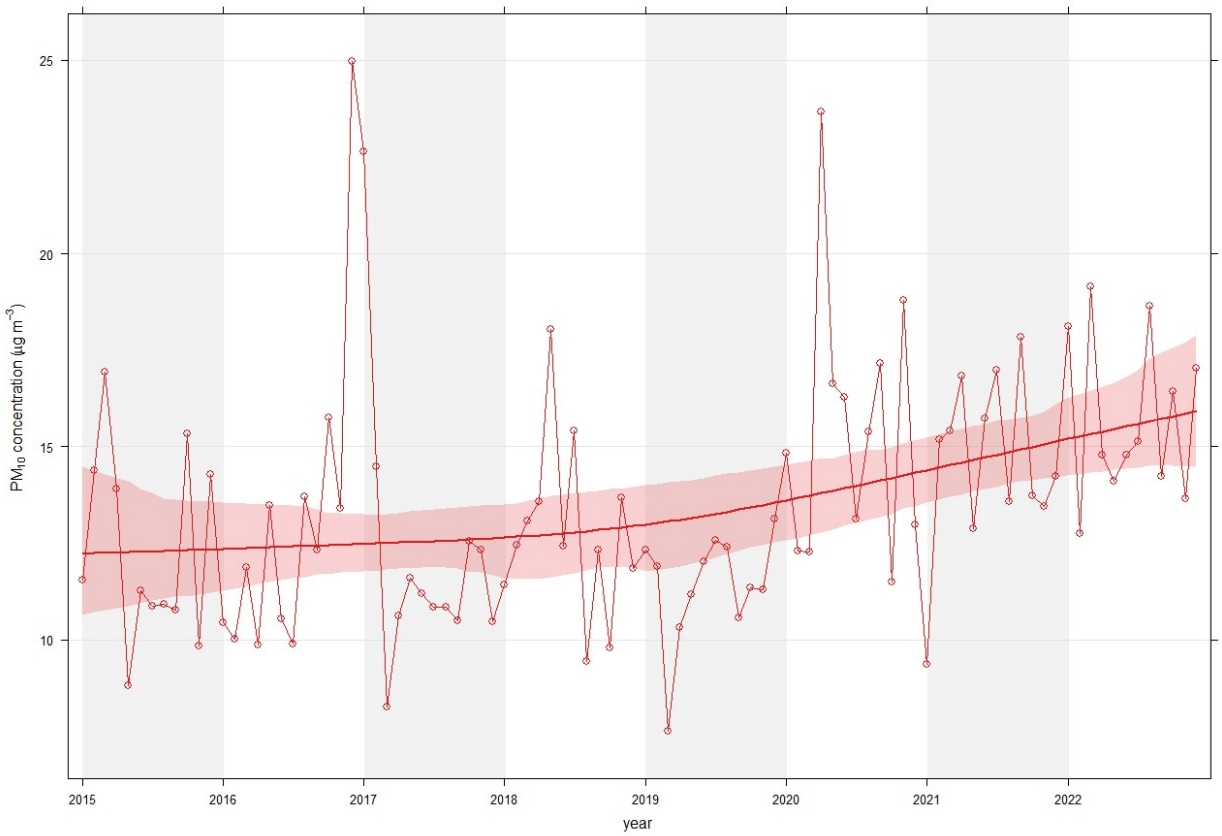
As previously mentioned, concentrations of PM_{10} and $PM_{2.5}$ have consistently remained well below the UK's AQOs at all monitoring sites. Historically, PM_{10} concentrations have declined gradually over time. However, the rate of improvement has decreased since 2016, to such an extent that concentrations at Reading's urban background AQMS have actually been on the rise in recent years.

This is demonstrated in **Figure 6**, below, which displays monthly mean de-seasonalised PM_{10} concentrations at the urban background AQMS. Although the rate of increase is very gradual, and concentrations remain well below AQOs, Reading Borough Council acknowledges the need to address the apparent worsening within its AQAP measures.

Regarding $PM_{2.5}$, there is no clearly discernible trend in either direction, but it is apparent that $PM_{2.5}$ concentrations are not improving. Again, although the rate of increase is very gradual, and concentrations remain well below AQOs, Reading Borough Council acknowledges the need to address the apparent worsening within its AQAP measures. For this reason, alongside increasing pressures from the

Government for Local Authorities to reduce $PM_{2.5}$ emissions across their boroughs, this AQAP places considerable weight to the consideration of measures to improve local PM concentrations. Measures to address PM_{10} should inherently address $PM_{2.5}$ also, as the two are inextricably linked.

Figure 6 - De-seasonalised monthly mean PM_{10} concentrations at Reading's AURN monitoring site.



1.2.3 AQMA Retention

The Reading AQMA is to be retained in its current form. The reasons for this are two-fold:

- Exceedances of the annual mean AQO for NO_2 are still present within the existing AQMA boundaries; and
- Reading Borough Council are intent on producing an AQAP which targets air quality improvements across the entire borough, not just exceedance areas.