

BRUNDALL NO₂ DIFFUSION STUDY – SUMMARY

Introduction

Nitrogen dioxide (NO₂) is one of the main pollutants emitted by road traffic. A survey of nitrogen dioxide concentrations in the air in Brundall has been carried out at a number of sites in the village between February 2022 and January 2023. The survey involved deploying diffusion tubes at eight selected locations exposed over periods of one month at each location. After each exposure period, tubes were collected and replaced by new tubes. Exposed tubes were sent to a laboratory for analysis. A full report of the survey has been prepared by Broadland District Council [1]. This report provides a summary of that report and the main findings.

Methods

The NO₂ diffusion tubes were located at the eight locations previously selected by Brundall Parish Council, shown in Figure 1. Figure 2 provides an illustration of a typical NO₂ diffusion tube.

Following the monthly exposures at each site, the concentration of NO₂ for each month was determined by chemical analysis and UV spectrophotometry, using UKAS approved procedures. This provided a data set covering each month of the year at each site.

Results and Discussion

The concentrations of NO₂ at each site each month are shown in Figure 3. This figure provides ‘raw’ NO₂ concentrations in micrograms per cubic meter ($\mu\text{g}/\text{m}^3$) i.e. those arising without any adjustment for bias due to variations in results between different UK laboratories. Raw data were subsequently subjected to further processing using DEFRA Bias Adjustment Factors, which produces slightly lower calculated concentrations of NO₂ (Figure 4).

Monthly average NO₂ concentrations ranged from 7 $\mu\text{g}/\text{m}^3$ to 37 $\mu\text{g}/\text{m}^3$ across all sites, with the highest concentrations occurring at site 8 near the A47. Concentrations at site 8 showed consistently higher concentrations than the other sites for most months of the year. The higher concentrations at site 8 reflect the influence of the high traffic volumes on the A47. The concentrations at site 8 also show more pronounced seasonal variation compared with the other sites, which is mostly likely due to a combination of seasonal variations in traffic flows during the year and meteorological conditions. Data from the other sites also show the effect of seasonal variations, with concentrations generally higher in the winter than in summer, which is a typical effect of meteorological conditions on air pollution.

Annual average NO₂ concentrations (bias adjusted) ranged from 8.3 $\mu\text{g}/\text{m}^3$ to 19.9 $\mu\text{g}/\text{m}^3$, with the highest concentrations being recorded at site 8. The lowest annual average was recorded at site 3, Highfield Avenue.

There are no current UK standards for monthly average NO₂ concentrations. However, the current UK annual average Air Quality Objective (AQO) is 40 $\mu\text{g}/\text{m}^3$. None of the (bias adjusted) annual average concentrations measured in the survey exceeded the UK AQO. Even the highest recorded concentration of 19.9 $\mu\text{g}/\text{m}^3$ at site 8 is only 50% of the AQO.

Conclusions

The results of the NO₂ survey in Brundall show that the concentrations of this pollutant at all sites monitored are well below the current UK Air Quality Objective. Annual mean concentrations are lower than those recorded at most other diffusion tube sites across Broadland and South Norfolk.

Concentrations of road traffic pollutants fall off rapidly with distance from the road, due to dispersion. The study included a calculation of NO₂ concentrations at the nearest receptor location to each diffusion tube. Concentrations at the receptor locations reflect the distance they are from the road. All concentrations at receptors are less than those measured at the diffusion tube monitoring sites and well below the annual AQO. For sites 3 and 5, the calculated receptor concentrations are less than the estimated background concentration, as measured at a background monitoring station at Lakenfields.

References

1. Broadland District Council. Brundall NO₂ Diffusion Tube Project 2022/23

Dr. Chris Muskett

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FIGURE 1 DIFFUSION TUBE MONITORING LOCATIONS



FIGURE 2- NO2 DIFFUSION TUBE



FIGURE 3 MONTHLY AVERAGE NO₂ RESULTS (µg/m³)

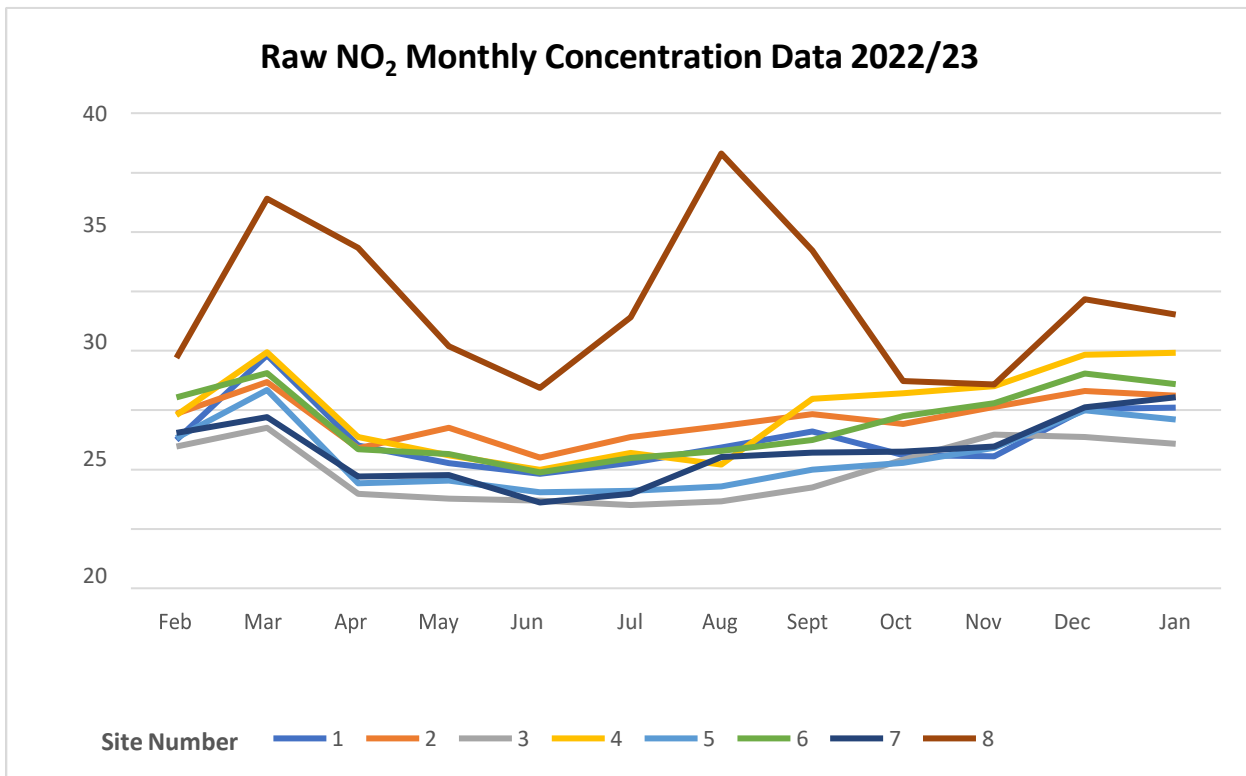


FIGURE 4 ANNUAL MEAN NO₂ RESULTS (µg/m³)

