



South Gloucestershire NO₂ Programme Air Quality Assessment Including air quality data from 2022-2023

Introduction

2018 Targeted Feasibility Study (TFS) local authorities (LAs) are LAs that were directed to implement measures to address exceedances at specific named road links as a result of their TFS work that was published in the 2018 Supplement to the Nitrogen Dioxide (NO₂) Plan. This group consists of Dudley, Reading, Sandwell, South Gloucestershire and Wolverhampton.

This report assesses NO₂ monitoring data along the directed road links throughout the calendar year (January - December) 2022 and 2023. Its purpose is to inform South Gloucestershire LA whether exceedances of the limit value for annual mean NO₂ at valid locations have been observed in 2022 or 2023.

The assessment considers the locally available diffusion tube and continuous analyser data and includes UK Urban NO₂ Network (UUNN) monitoring locations and Automatic Urban and Rural Network (AURN) stations where this monitoring is available.

If an LA has no exceedances of the NO₂ limit value of 40 µg/m³ registered by monitors in valid locations, along the LA's directed road links, that LA will be said to 'have achieved success' and will pass this assessment.

An LA must demonstrate that they have achieved success in two consecutive years (over the course of two reporting periods), before they can be said to "have maintained success" and be ready to exit the NO₂ Programme.

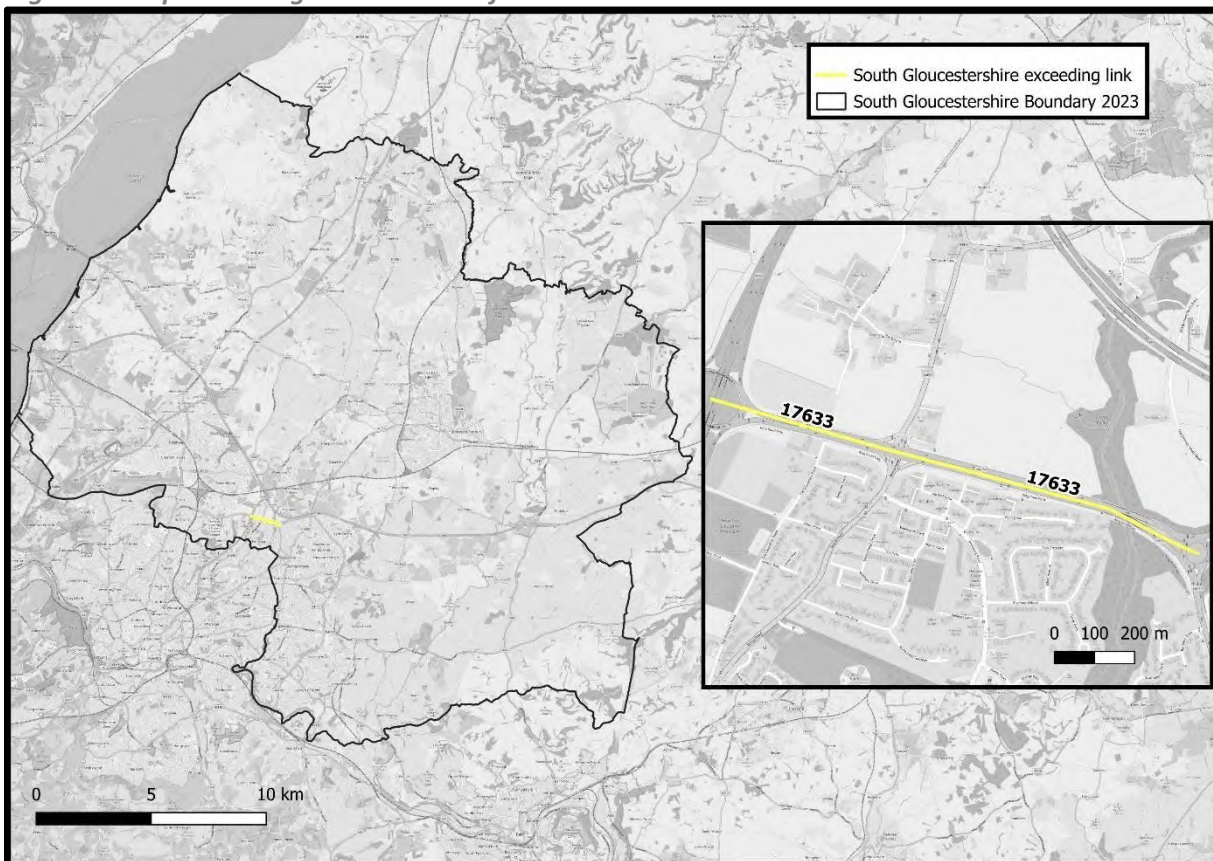


Directed Measures for South Gloucestershire

Table 1: Measures identified in the 2018 Supplement to the NO₂ Plan

LA	Location (Census ID)	Measure	Predicted year of success	Target Measure Implementation Date	Actual Measure Implementation Date
South Gloucestershire Council	17633	Traffic management measures	2019	31/08/2019	11/08/2019

Figure 1- Map indicating the locations of the directed road link in South Gloucestershire Council





Executive Summary

South Gloucestershire LA has **passed** the assessment for 2023. However, as there were exceedances present in 2022, the LA needs to submit one additional year of data with no exceedances in order to demonstrate that success has been maintained.

In 2022, there were **2 exceedances** observed at valid locations that are located along the directed road link. These monitors are deployed and owned by South Gloucestershire Council.

In 2023, there were **0 exceedances** observed at valid locations that are located along the directed road link. These monitors are deployed and owned by South Gloucestershire Council.

There were 0 exceedances observed on the UUNN (reporting 29 $\mu\text{g}/\text{m}^3$ in 2022, and 26 $\mu\text{g}/\text{m}^3$) in 2023.

There is 1 LA owned automatic analyser located on the directed road link 17633 (reporting 22.5 $\mu\text{g}/\text{m}^3$ in 2023).

The uncertainty and risk of these findings has been assessed. Overall, there is a **low** level of uncertainty in the 2022 and 2023 results due to the annual mean concentrations recorded in triplicate and several primary tubes giving good coverage of the directed road link.

There is a **low** level of the risk of the LA not passing the assessment in 2024, due to no primary tubes still being categorised as “exceeding” or “at risk” sitting within 10% of the legal limit value, in 2023.

All monitoring sites which meet the Air Quality Standards Regulations 2010 (AQSR) siting criteria and data capture requirements are valid locations. Where this is not available along the directed road links in the LA, results from other monitoring sites which do not meet these criteria may be considered as valid locations subject to certain requirements. This ensures that the assessment is based on the best available evidence. See **Annex A** for details on assessment criteria.

A summary of the findings is presented in Table 2 below.

Table 2: Summary of LA Success in 2022 & 2023

Year	Success Achieved?	Details	Next Steps
2022	The LA has not achieved success	2 primary exceedances. 3 “at risk” primary sites.	-
2023	The LA has achieved success in 2023	0 primary/secondary/tertiary exceedances. 0 primary “at risk” sites.	Gather additional year of data to confirm whether success is maintained.



Actions

The LA is requested to undertake the following evidence-related actions:

- Provide an additional year of monitoring data to demonstrate that success has been maintained in 2024.
- Continue monitoring at sites along directed link 17633 and report these results to JAQU in all data submissions for 2024 measurements.

Results

Exceeding Locations

- 2 primary exceeding monitoring sites have been recorded in 2022.
- No exceeding monitoring sites have been recorded in 2023.
- No exceedances have been reported on the UUNN along the directed link in 2022 or 2023.

'At Risk' Locations

Some monitoring locations that didn't record an exceedance in 2022 have been identified as being 'At Risk' of recording an exceedance in future years.

Monitoring locations have been identified as being 'At Risk' of recording an exceedance in future years if they meet this criterion:

- 2022 annual average within 10% of the limit value: given measurement uncertainty and year on year variations which would be expected due to factors such as meteorology, there is a reasonable chance of these exceeding the following year.

Details of locations where exceedances and "at risk" sites were measured in 2022 are detailed in *Table 3*.

JAQU recommends the LA keeps exceeding and "at risk" sites under close observation.

As shown in *figure 2*: No "at risk" sites were reported in 2023, the risk of a future exceedance is categorised as **low**.

Discussion

In 2023, no sites reported as exceeding or at risk. The decrease of approximately 10 µg/m³ of Nitrogen dioxide shown from 2022 to 2023 is promising, hence the risk of non-compliance in 2024 is categorised as **low**. South Gloucestershire should continue monitoring directed link 17633 and provide an additional year of data to demonstrate that they are able to maintain success.

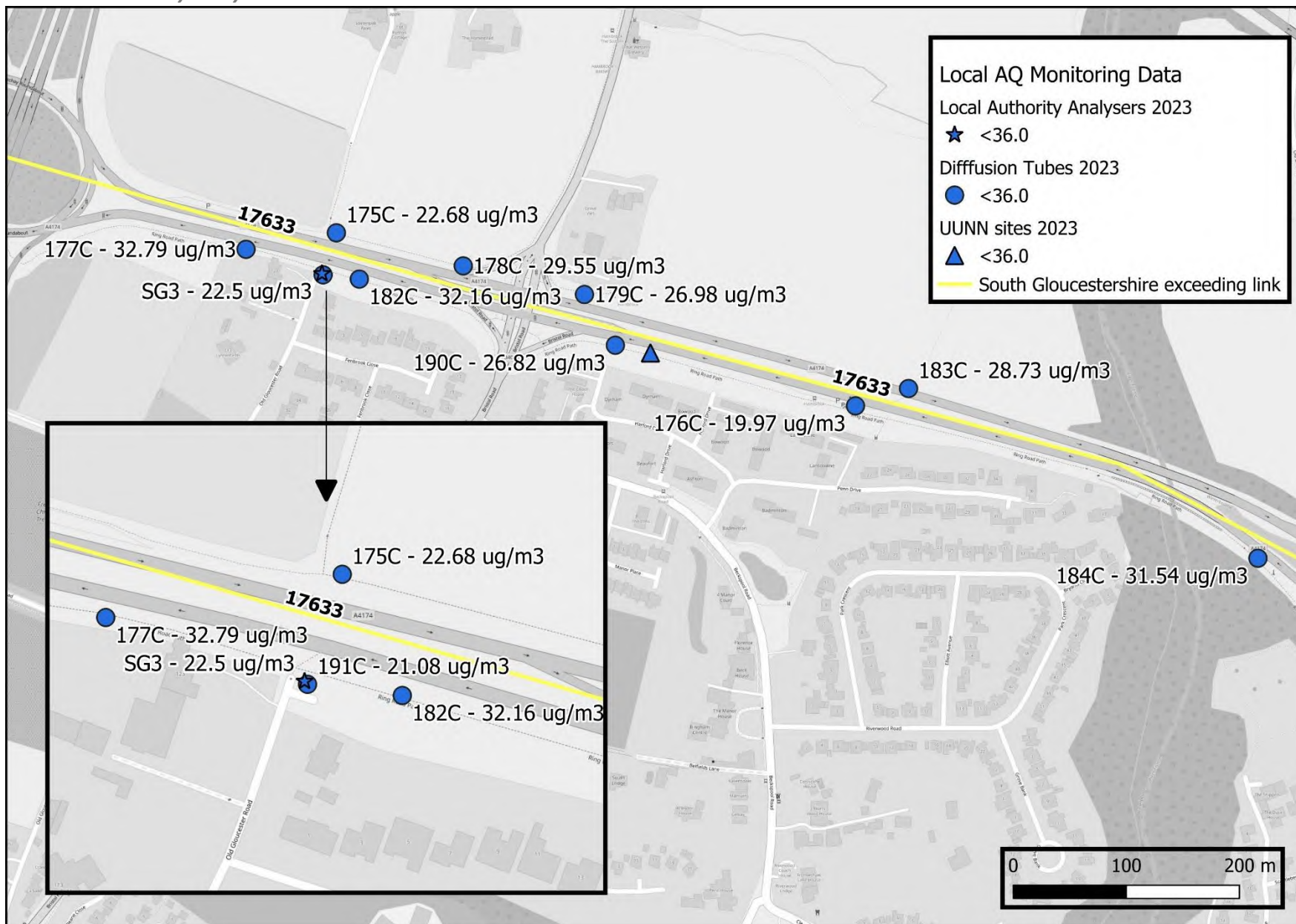


Table 3: Monitoring Locations exceeding or within 10% of the legal limit value in 2022.

Site ID	Exceeding or "at risk"	Site Name	Monitoring category	Bias adjusted NO ₂ annual average (µg/m ³)	Measurement Site Easting (X)	Measurement Site Northing (Y)
182ABC	Exceeding	Hambrook - A4174 Westbound Ip613 btwn Bristol Rd & Old Glos Rd	Primary	42.41	363805	178496
177ABC	Exceeding	Hambrook - A4174 Westbound nr M32 J1 lane sign	Primary	43.25	363705	178523
183ABC	At risk	Hambrook - A4174 Eastbound Ip582 by Footpath Frome Valley Walkway	Primary	36.85	364290	178396
184ABC	At risk	Hambrook - A4174 Westbound Ip 567 near BH Viaduct	Primary	39.51	364598	178244
178ABC	At risk	Hambrook - A4174 Eastbound Ip608 by Winterbourne B4058 road sign	Primary	36.81	363897	178507



Figure 2: Locations of monitoring locations in 2023, labelled with 2023 annual average NO₂ concentrations in µg/m³, NB diffusion tube 191C is co-located with Local Authority analyser SG3.





Annex A: AQSR requirements and NO₂ Programme assessment

Figure 3: AQSR requirements summary and NO₂ Programme assessment. See [NO₂ Programme local plan assessment and AQSR & LAQM regime differences](#) for more information.

Where possible, the NO₂ Programme assesses air quality using measurements that conform to Air Quality Standards Regulations 2010 (AQSR). An AQSR monitor should fulfil all 8 of these requirements

Data Capture

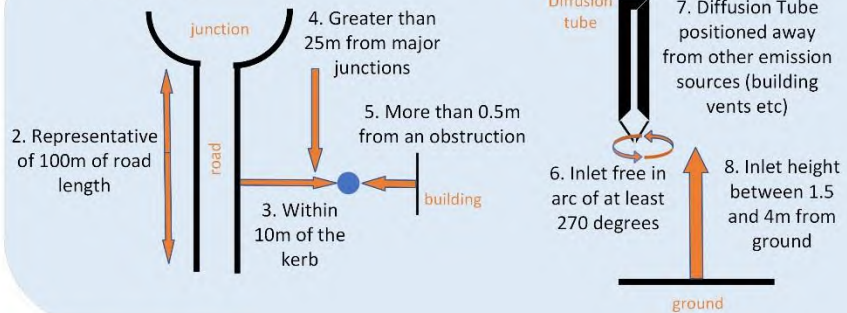


1. At least 11 out of 12 months of data capture

A tube that fails data capture requirements in one year might capture 11 or 12 months of data in a future year. If this tube is registering high values this carries a risk that the tube records an AQSR exceedance in a future year.

If it is the only available source of data, a tube that passes all other location-based requirements (2-7) and fails only on data capture may be annualised if there is >25% data capture and used in the assessment.

Location



A tube that does not meet one of the location based requirements may also not meet the data capture requirement and may need to be annualised.

If it is the only available source of data, a tube that does not meet one or more of the location requirements may be used in the assessment under certain circumstances.

Use of data in NO₂ Programme assessment

In the NO₂ Programme,
we call a monitor that meets all AQSR criteria a **primary monitor**
we call a monitor that meets all location requirements but does not have sufficient data capture a **secondary monitor**
we call a monitor that does not meet one or more of the location requirements a **tertiary monitor**

The priority order for monitors to inform the assessment is always

primary > secondary > tertiary

Where a primary is available, it will be used. Only where a primary is unavailable will a secondary with > 25% data capture be considered, and only where both of these are unavailable a tertiary may be used.

Air quality assessments for Air Quality Action Plans, and Annual Status Reports and Air Quality Management Areas as part of Local Air Quality Management (LAQM) use different criteria and are often sited in other locations that do not meet the stringent AQSR requirements. These activities are focussed on targeting local pollution hotspots from a variety of sources including roadside and other sources. In LAQM assessments, the monitor results are often adjusted to 'areas of relevant public exposure'.



Monitoring locations in the LA have been separated into three categories based on whether the monitor conforms to these AQSR requirements, shown in [Table 4](#). All primary monitors in the geographical scope of the LAs Clean Air Plan will be considered in the state assessments and inform the result. JAQU will check that monitoring is available on key road links, defined as:

- Locations where an exceedance was modelled in the Local NO₂ Plan Without Measures Scenario, for the year when success with measures was predicted.
- Locations where an exceedance has been measured (by monitoring of any category) in the year of assessment.
- In the case of State 3, where an exceedance was measured (by monitoring of any category) in the previous year.

In these locations, where there are multiple monitors available that report on the same stretch of road, the following priority order is used: Primary > Secondary > Tertiary

Where available, a primary monitor always takes priority. Where a primary measurement is not available, a secondary measurement will be considered (if available) after being annualised provided that secondary monitor has greater than 25% data capture rate. If neither of these measurements are available, a measurement from a tertiary monitor may be used to inform the assessment outcome for a key road link. Secondary and tertiary monitoring outside of the key road links are not considered in the state assessment.



Table 4: Categories for monitoring locations

Category	Definition	Usage in assessment
Primary	Any monitoring point that meets all AQSR criteria for assessment location and data capture.	<p>Always considered in state assessments.</p> <p>Where these are present, they take priority for assessment outcome over other monitor categories.</p>
Secondary	Any monitoring point that does not meet the AQSR criteria for data capture, but that does meet all location-based AQSR requirements.	<p>Only considered if on a key road link where there is no primary monitoring available.</p> <p>Provided there is greater than 25% (3 months) of data capture, these monitors can be annualised and used in state assessments if there is no primary monitor available. However, doing so introduces additional uncertainty that will be recognised in the assessment.</p> <p>JAQU requires that measurements at these locations must be reported in the following year.</p>
Tertiary	Any monitoring point that does not meet one or more of the location-based AQSR criteria.	<p>Only considered if on a key road link where there is no primary or secondary monitoring available.</p> <p>Use of tertiary monitoring is subject to certain requirements and doing so introduces additional uncertainty that will be recognised in the assessment.</p> <p>The location of any exceedances in this category should be verified in person to confirm that the reported locations are accurate.</p>



When secondary measurements are considered in the assessment, the results are first annualised in line with the method in the LAQM Technical Guidance (22). Where an LA has already completed this analysis, these values will be used. In cases where the LA has not completed annualisation but it is needed to meet AQSR requirements, JAQU will complete this using the same annualisation inputs as the LA as far as possible.

Tertiary measurements are only used when primary or secondary measurements are unavailable on key road links. Modelling has been carried out to quantify the impacts on measured NO_2 concentrations where location AQSR criteria are not met, allowing for consideration of tertiary measurements within state assessments in certain cases by accounting for these impacts. Where modelling has indicated significant positive or negative mean impacts on measured NO_2 concentrations, a 'tolerance limit value' is calculated. This is applicable only for the AQSR criteria: 'distance to obstruction' and 'height of diffusion tube'. Measured concentrations at sites which do not meet AQSR criteria for these reasons are compared to the tolerance limit value which provides analytical context to indicate if a similar site meeting all location AQSR criteria would exceed the annual mean limit value.

A 'tolerance limit value' is not calculated for measured concentrations at sites which do not meet other location AQSR criteria, details on how these are approached are shown in [Table 5](#). To account for variability in the modelled impacts, a range is calculated and applied to measured values at tertiary sites, shown in [Table 5](#). This represents the additional uncertainty introduced due to the use of tertiary measurements.

Example for a tertiary measurement not meeting '≥0.5 m from an obstruction' criterion, with a measured concentration of $41.5 \mu\text{g}/\text{m}^3$:

- Modelling shows mean impact for <0.5 m to an obstruction is $+2.5 \mu\text{g}/\text{m}^3$.
- Mean impact + annual mean limit value = tolerance limit value: $40.5 + 2.5 = 43.0 \mu\text{g}/\text{m}^3$.
- Variation from mean impact for this criterion is ± 0.5 .
- Applied to measured value to determine variability range: $41.5 + 0.5 = 42.0 \mu\text{g}/\text{m}^3$, $41.5 - 0.5 = 41.0 \mu\text{g}/\text{m}^3$.
- Range is fully below tolerance limit value; site isn't considered as an exceedance.

A summary of how each locational factor is accounted for is shown in [Table 5](#). Certain situations and combinations of AQSR criteria not being met cannot be accounted for with this method, and results from such monitors will not be considered in the state assessments.



Table 5: Use of tertiary measurements

Failure Criteria	Tolerance Limit Value ($\mu\text{g}/\text{m}^3$)	Upper Range of Measurement ($\mu\text{g}/\text{m}^3$)	Lower Range of Measurement ($\mu\text{g}/\text{m}^3$)
Distance to Obstruction [significant impact]	43.0	+0.5	-0.5
Height (applied per 1m) [significant impact]	41.6 (1m too low) 39.4 (1m too high)	+0.8	-0.7
Representative of 100m [no significant impact]	Not calculated: annual mean limit value of 40.5 applied	+0.6	-0.5
Distance to Major Junction [no significant impact]		+3.1	-2.9
Free Inlet	Tolerance limit value and range not calculated: analysis indicates this is linked to distance to obstruction.		
Distance to Kerb >10m	Tolerance limit value and range not calculated: not sufficient data available within the model on monitoring locations >10m from the kerb to quantify impacts.		
Close to other Emission Sources	Measurement is not used: unlikely to be measuring roadside emissions.		