



Llywodraeth Cymru  
Welsh Government

# Tackling roadside nitrogen dioxide concentrations in Wales

Welsh Government supplemental plan to the UK plan for tackling roadside nitrogen dioxide concentrations 2017 – Interim Data on NO<sub>2</sub> Concentrations for the Motorway and Trunk Road

September 2019



Mae'r ddogfen yma hefyd ar gael yn Gymraeg.  
This document is also available in Welsh.

## Foreword

The Welsh Government is committed to building healthier communities and better environments. Tackling poor air quality is a priority that is reflected in our national strategy – ‘Prosperity for All’. In November 2018 we published our Welsh Government supplemental plan to the UK plan for tackling roadside nitrogen dioxide (NO<sub>2</sub>) concentrations 2017 setting out how we will reduce concentrations of NO<sub>2</sub> around roads where levels are above legal limits.

The plan built on Section 7.6 (Additional Actions in Wales) of the 2017 UK plan for tackling roadside nitrogen dioxide concentrations, setting out how we will comply within the shortest possible time with the limit values for NO<sub>2</sub>. These values are set by the Ambient Air Quality Directive (2008/50/EC) and the Air Quality Standards (Wales) Regulations 2010.

This report is to confirm the current levels of NO<sub>2</sub> concentrations on the Welsh Government Motorway and Trunk Road network at the five sites identified in the plan. It provides the data from December 2017 to July 2019 and a narrative with the ongoing issues facing the Welsh Government and Ministers in relation to the five sites identified on the Motorway and Trunk Road network along with ways forward to help lower the NO<sub>2</sub> levels further.

This report should be read in conjunction with the following:-

Welsh Government supplemental plan to the UK plan for tackling roadside nitrogen dioxide (NO<sub>2</sub>) concentrations 2017, published in November 2018:-

<https://gov.wales/air-quality-plan>

Welsh Government Transport Appraisal Guidance Reports Stages 1, 2 and 3 for Tackling Roadside Nitrogen Dioxide Concentrations on the Motorway and Trunk road Network sites in Wales:-

<https://gov.wales/tackling-roadside-nitrogen-dioxide-concentrations-wales>

<https://gov.wales/tackling-roadside-nitrogen-dioxide-concentrations-wales-weltag-stage-3>

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## **1.0 Summary of Interim Data on NO<sub>2</sub> Concentrations for the Motorway and Trunk Road**

This report provides a summary of the NO<sub>2</sub> concentrations at the five sites on the motorway and trunk road network and has been provided following the commitment to present results as set out in the Welsh Government supplemental plan to the UK plan for tackling roadside nitrogen dioxide concentrations 2017, published November 2018.

As detailed in the supplemental plan, the five sites where NO<sub>2</sub> concentrations are above the limit level – 40 µg/m<sup>3</sup> set out in the EU Ambient Air Quality Directive (2008/50/EC) and the Air Quality Standards (Wales) Regulations 2010 are:-

1. A494 at Deeside (North Wales Zone);
2. A483 near Wrexham (North Wales Zone);
3. M4 between Junctions 41 and 42 at Port Talbot (Swansea and South Wales Zone);
4. M4 between Junctions 25 and 26 at Newport (South Wales Zone); and
5. A470 between Upper Boat and Pontypridd (South Wales Zone).

In June 2018, 50mph speed limits were introduced at the five sites as these were considered to bring compliance with EU Directive NO<sub>2</sub> concentrations in the shortest possible time. Precautionary Retained Measures (PRM) were included in the plan albeit these measures would have taken a longer period of time to implement. The PRMs have been developed since November 2018, however the timetable to implement the PRMs remains as set out in the plan.

The following data is reported in the appendices to this report:-

- DEFRA Pollution Climate Mapping Data (PCM) (Modelled information)
- Interim Diffusion Tube Monitoring Data (Roadside information)
- Interim Speed Data

The appropriate graphical representation of the data has been shown in Appendix D.

The following points can be drawn from the interim data:

- Baseline PCM data for 2017/2018 continues to show NO<sub>2</sub> concentrations lower than those at the roadside, this was no surprise as it was highlighted in the WeITAG Stage 3 reporting;
- Whilst the roadside data is different to the PCM, the initial indications are positive that the NO<sub>2</sub> concentrations have reduced at the five sites from December 2017 to July 2019;
- Speed profiles demonstrate that mean speeds are above 50mph for all five sites, however, it is expected that with the Average Speed Cameras now in place at four of the sites, compliance will be improved with the 50mph speed limits. The M4 Newport has spot speed cameras in place as part of the variable speed limit;
- Based on the data available and to allow the Welsh Government to report against EU Directive NO<sub>2</sub> limits and comment further on the effectiveness of the 50mph speed limit, additional NO<sub>2</sub> data adjusted against national bias factors needs to be collected for the calendar year 2019. This will allow for 'like for like' data to be compared with 2018 calendar year;
- From the graphs, all sites have a positive trend that the NO<sub>2</sub> concentrations are reducing on all data sets;
- The situation remains complicated as air quality is sensitive to a number of issues including the weather/seasonal effects, traffic flows including volume, speeds and fleet mix;
- Until additional information is obtained and the trends remain positive, it is too early to make firm conclusions or any other recommendations to remove the measures that have been either implemented or proposed at the five sites;
- Whilst the indicated reduction in NO<sub>2</sub> concentrations is positive news for the five sites, in particular the A483 Wrexham, A494 Deeside and M4 Port Talbot, as highlighted in the supplemental plan, the Welsh Government will continue with the goal of achieving compliance in the shortest time possible. This includes the continued development and the stakeholder engagement on the PRMs; and
- The Welsh Government remains committed to achieve compliance in the shortest possible time and therefore all measures introduced at the five sites will be kept in place until further data is available for review.

A further report will be published in March 2020 on the next set of data for NO<sub>2</sub> concentrations for calendar year 2019 adjusted to national bias factors. Within this report a more comprehensive update on the progress made with the PRMs will be made.

## Appendices

## Appendix A

### DEFRA Pollution Climate Mapping Data

Data obtained from the DEFRA Pollution Climate Mapping (PCM) model was used during the Welsh Government WelTAG Transport Planning Appraisal process and helped identify the measures to be implemented at the five sites. The table below details the predicted NO<sub>2</sub> concentrations that were used to inform the WelTAG Appraisals.

**Baseline PCM predicted NO<sub>2</sub> concentrations at the five sites taken from the plan (2017 model data information):**

Stretch of Road	Site Location	NO <sub>2</sub> Predicted Baseline Concentrations (µg/m <sup>3</sup> ) 2017					
		2017	2018	2019	2020	2021	2022
<b>A483 Wrexham</b>	Wrexham	<b>41.2</b>	39.3	37.6	35.7	33.5	-
<b>A494 Deeside</b>	Aston Hill	<b>50.3</b>	<b>47.9</b>	<b>45.7</b>	<b>43.2</b>	<b>40.4</b>	37.8
	Jnc A550 – Jnc A548	<b>48.4</b>	<b>46.1</b>	<b>44.1</b>	<b>41.7</b>	39.1	36.7
	Jnc A458 Shotwick Rd	<b>41.9</b>	<b>39.8</b>	37.9	35.9	33.7	31.6
<b>A470 Pontypridd</b>	Pontypridd	<b>47.6</b>	<b>45.7</b>	<b>43.9</b>	<b>41.7</b>	39.1	-
	Upper Boat	<b>41.8</b>	<b>40.1</b>	38.5	36.6	34.3	-
<b>M4 Newport Junction 25-26</b>	West of River Usk	<b>48.5</b>	<b>46.1</b>	<b>44.0</b>	<b>41.7</b>	39.0	-
	East of River Usk	<b>40.8</b>	38.9	37.2	35.3	33.1	-
<b>M4 Port Talbot Junction 41-42</b>	Jnc 41-42	<b>45.2</b>	<b>43.2</b>	<b>41.4</b>	39.4	36.9	-

Since publication of the supplemental plan, DEFRA has published updated PCM NO<sub>2</sub> baseline concentrations for 2018 and these are detailed in the table overleaf.



**Baseline PCM predicted NO<sub>2</sub> concentrations at the five sites updated with 2018 model information:**

Stretch of Road	Site Location	NO <sub>2</sub> Predicted Baseline Concentrations (µg/m <sup>3</sup> ) 2018					
		2017	2018	2019	2020	2021	2022
<b>A483 Wrexham</b>	Wrexham	40.2	-	37.5	35.7	33.5	31.4
<b>A494 Deeside</b>	Aston Hill	49.4	-	45.8	43.3	40.6	38.0
	Jnc A550 – Jnc A548	47.3	-	43.8	41.5	39.0	36.6
	Jnc A458 Shotwick Rd	40.5	-	37.3	35.4	33.3	31.2
<b>A470 Pontypridd</b>	Pontypridd	46.6	-	43.9	41.7	39.3	36.9
	Upper Boat	41.1	-	38.7	36.8	34.6	32.5
<b>M4 Newport Junction 25-26</b>	West of River Usk	50.4	-	46.7	44.2	41.4	38.8
	East of River Usk	41.4	-	38.3	36.4	34.3	32.2
<b>M4 Port Talbot Junction 41-42</b>	Jnc 41-42	44.9	-	42.0	40.0	37.6	35.3

The concentrations have varied slightly and the compliance date has increased within PCM data model (2018) information at two of the sites. Baseline compliance at both M4 sites has increased above 40µg/m<sup>3</sup> in 2021 for Newport and 2020 for Port Talbot. Therefore the new model information shows that without implementation of any measures, full compliance at the site is predicted as follows:

- A483 Wrexham – by the end of 2018 (no change)
- A494 Deeside – by the end of 2022 (no change)
- A470 Pontypridd – by the end of 2021 (no change)
- M4 Newport – by the end of 2022 (extended by one year)
- M4 Port Talbot – by the end of 2021 (extended by one year)

The reason for the above changes are principally as a result of updates to the traffic count data used in the model that is produced by the Department for Environment, Food and Rural Affairs and the Department for Transport.

Whilst this data was key to the development of the measures for the plan and used in the WeITAG process, it is considered that the roadside data is more representative for decisions to be made moving forward.

## Appendix B

### Interim Diffusion Tube Monitoring Data

Concentrations of NO<sub>2</sub> at the roadside at each of the five sites have been recorded via a series of triplicate diffusion tube since mid-December 2017 and the data has been used to help establish the effect that the measures have had on NO<sub>2</sub> concentrations. To help obtain a more accurate picture on concentrations, these tubes were supplemented with continuous reference method analysers in August 2019. Data from these analysers has not been included in this report but will be included within subsequent reports.

The table below details the NO<sub>2</sub> concentrations recorded via the diffusion tubes during the 6-month period prior to the introduction of the 50mph speed limits in June 2018. The data has been averaged for the year and corrected for seasonal variations using national bias adjustment factors. Only the national factors were applied to the 6-month data, due to the South Wales continuous monitor not being calibrated.

Bias adjustment factors are used in adjusting the results that are obtained via diffusion tube methods. Further information on the need for adjustment is available at: <https://laqm.defra.gov.uk/bias-adjustment-factors/bias-adjustment.html>

**NO<sub>2</sub> concentrations prior to the 50mph speed limits (6 months – 18th December 2017 to the 4th June 2018):**

Site Type	6-month average NO <sub>2</sub> concentration (µg/m <sup>3</sup> ) using national bias adjustment factor
<b>A483 Wrexham – North Wales</b>	
Roadside	<b>54.1</b>
Urban Background	17.1
<b>A494 Deeside – North Wales</b>	
Roadside	<b>43.6</b>
Urban Background	19.7
<b>A470 Pontypridd – South Wales</b>	
Roadside	<b>60.4</b>
Urban Background	18.7
<b>M4 Newport – South Wales</b>	
Roadside	<b>64.0</b>
Urban Background	24.7
<b>M4 Port Talbot - South Wales</b>	
Roadside	<b>52.2</b>
Urban Background	14.1

The table below details the NO<sub>2</sub> concentrations recorded in the 12-month period following implementation of the 50mph speed limits in mid-June 2018. This data has been corrected using local bias adjustment as the data does not cover a calendar year. In addition, whilst the national database includes some data obtained from monthly exposures, the local monitoring has been undertaken solely via conducting fortnightly changeovers of the diffusion tubes (in italics the national bias adjustment figures have been included for comparison purposes).

The table also details the NO<sub>2</sub> concentrations for the 2018 calendar year that have been corrected using local bias adjustment. The data has been provided for comparison and demonstrates that the adjustment factor when applied to the Urban Background sites (that are less susceptible to changes in NO<sub>2</sub>) are yielding similar or identical concentrations.

**Table showing the NO<sub>2</sub> concentrations with 50mph speed limits in place (12 months – July 2018 to July 2019).**

<b>Site Type</b>	<b>July 2018 -July 2019<sup>1</sup> mean NO<sub>2</sub> concentration (µg/m<sup>3</sup>) using local bias adjustment factor (0.80)<sup>2</sup></b>	<b>January – December 2018 annual mean NO<sub>2</sub> concentration (µg/m<sup>3</sup>) using local bias adjustment factor (0.81)<sup>3</sup></b>	<b><i>July 2018 -July 2019 12-month average NO<sub>2</sub> concentration (µg/m<sup>3</sup>) using national bias adjustment factor (0.89)<sup>4</sup></i></b>
<b>A483 Wrexham – North Wales</b>			
Roadside	39.7	<b>46.1</b>	<b>44.2</b>
Urban Background	13.8	15.2	15.4
<b>A494 Deeside – North Wales</b>			
Roadside	35.0	38.6	39.0
Urban Background	16.1	17.5	17.9
<b>A470 Pontypridd – South Wales</b>			
Roadside	<b>47.9</b>	<b>52.2</b>	<b>53.3</b>
Urban Background	16.5	16.8	18.4
<b>M4 Newport – South Wales</b>			
Roadside	<b>55.3</b>	<b>58.2</b>	<b>61.5</b>
Urban Background	20.9	21.5	23.2
<b>M4 Port Talbot - South Wales</b>			
Roadside	<b>40.4</b>	<b>44.5</b>	<b>45.0</b>
Urban Background	11.5	12.2	12.8

<sup>1</sup> Diffusion tube monitoring periods 8-20, tubes exposed from 2<sup>nd</sup> July 2018 – 1<sup>st</sup> July 2019

<sup>2</sup> Local bias factor from co-located tubes at Wrexham continuous monitoring site for this period

<sup>3</sup> Local bias factor from co-located tubes at Wrexham continuous monitoring site for the calendar year

<sup>4</sup> From Spreadsheet v06/19 in Figure 1

## Appendix C

### Interim Speed Data

The 50mph speed limits were initially implemented at four of the five sites in mid-June 2018. The one exception is the M4 at Newport where a 50mph speed limit was set to operate overnight (21:00 to 06:00) via the variable speed limit (VSL) in May 2018. Following publication of the supplemental plan, these 50mph speed limits have remained in force. Again, the one exception is the M4 at Newport where a maximum 50mph speed limit was set to operate at all times via the VSL in February 2019 and is subject to speed monitoring via spot speed cameras.

**Table showing a summary of mean traffic speeds at each location following their initial implementation in June 2018 to August 2019:**

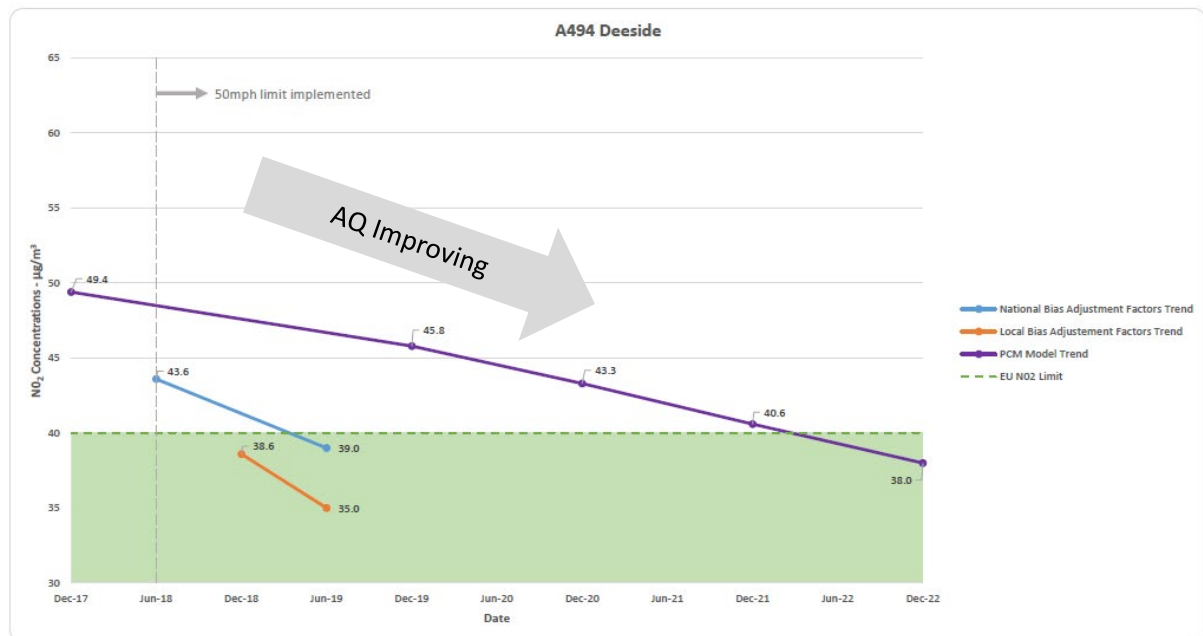
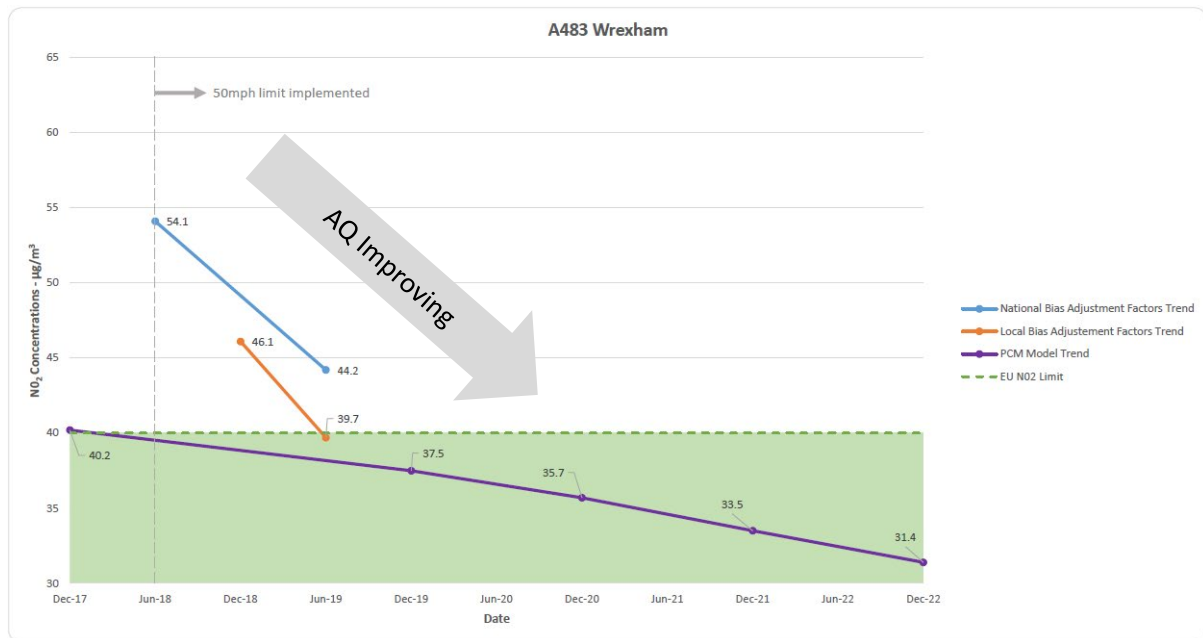
Location	Time period	Mean Speed
A483 Wrexham	24 hours	57mph
A494 Deeside	24 hours	58mph
A470 Pontypridd	24 hours	58mph
M4 Junction 41 to 42, Port Talbot	24 hours	55mph
M4 Junction 25a to 26, Newport Maximum 50mph speed limit set overnight May 2018 to March 2019	24 hours	52mph*
	21:00 to 00:00	53mph*
	00:00 to 06:00	53mph*
M4 Junction 25a to 26, Newport Maximum 50mph speed limit set to operate at all times February 2019 onwards	24 hours	51mph*

*\*NOTE – Mean speeds take into account occasions when the variable speed limit may also have been automatically set below 50mph. It is not possible to provide data for those occasions when only a 50mph speed limit was displayed.*

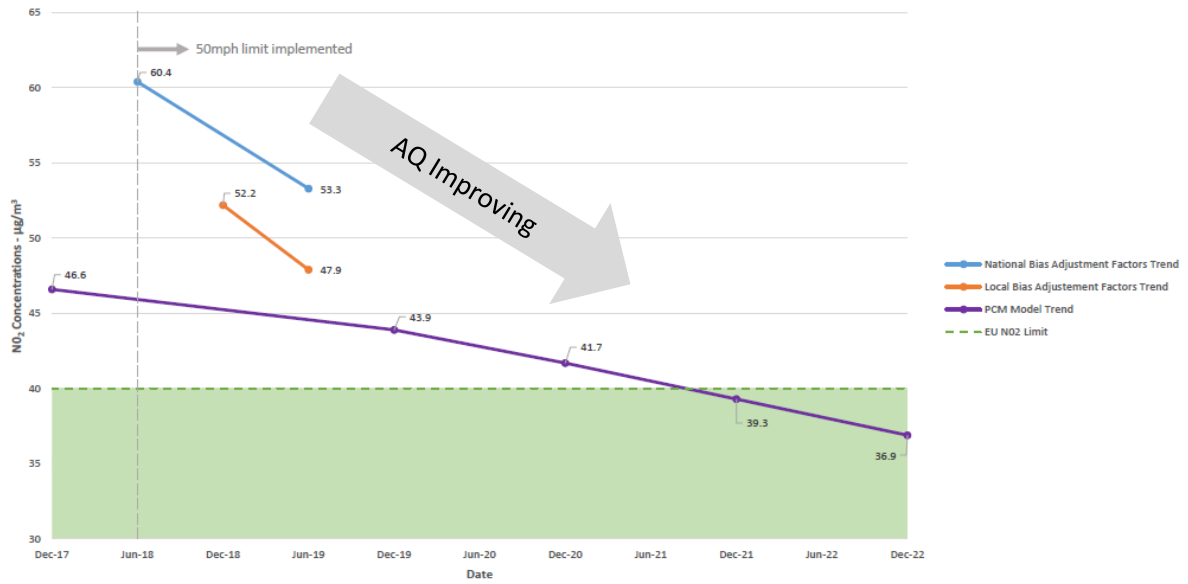
## Appendix D

### Graphs

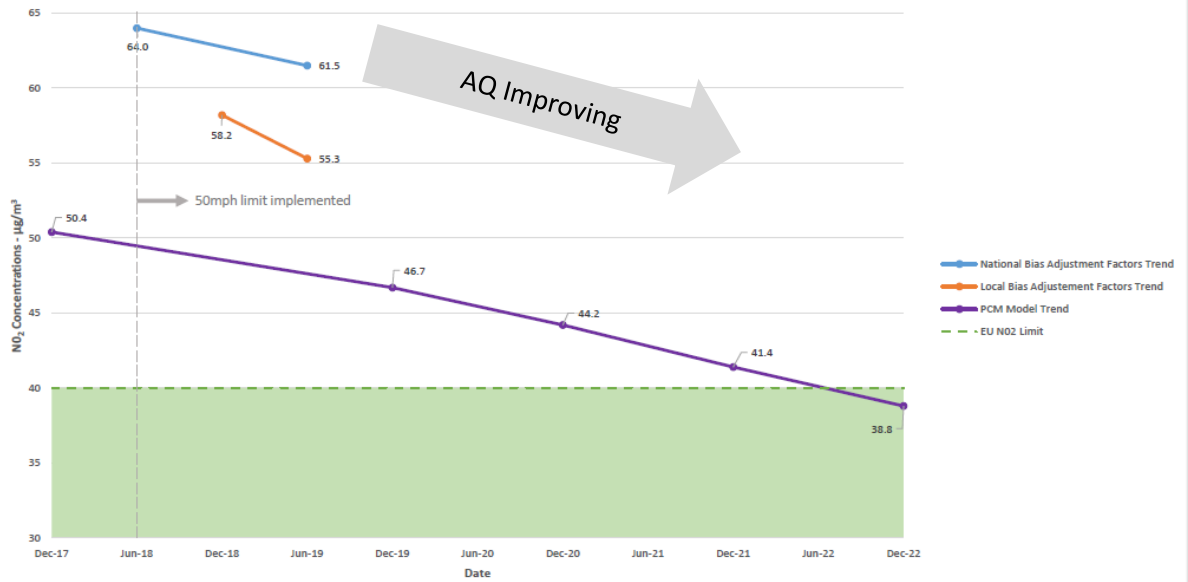
The following graphs are showing the various data sets at the five sites:



### A470 Pontypridd



### M4 Newport



### M4 Port Talbot

