



# OXFORD TRAFFIC FILTERS INTERIM SCHEME

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Air quality technical note

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## 1. INTRODUCTION

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Oxfordshire County Council (OCC) are considering introducing a temporary congestion charge pending the introduction of the trial traffic filters approved by the Council in November 2022 (which has been delayed by the ongoing Botley Road closure). The scheme would be identical to the trial traffic filters, except that drivers of cars without a permit would have the option to pay a daily charge to drive through the six filter locations, which would become congestion charge locations. This means they can be introduced while Botley Road is closed, because all areas of the city would remain accessible (albeit an area of the city centre would only be accessible by paying the congestion charge).

This technical note summarises the likely air quality impacts on annual mean NO<sub>2</sub> concentrations as a result of implementing the congestion-charge traffic filters.

## 2. METHODOLOGY & LIMITATIONS

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### 2.1 METHODOLOGY

In order to determine the impact on air quality by implementing an interim traffic filter scheme without conducting full air quality dispersion modelling, the change in Annual Average Daily Traffic (24 hour average flows, AADT) can be used as a proxy indicator.

A comparison in total AADT was made between three scenarios:

- **DMT1** – 2025 ‘do minimum with traffic filters’ scenario with full air quality dispersion modelling
- **DM-BR** – 2025 ‘do minimum’ scenario that includes the Botley Road closure, but does not include traffic filters
- **DS-RUC1** – the preferred option implementing a £5 congestion charge

The changes in AADT along all road links under the DM-BR and DS-RUC1 scenarios relative to the modelled DMT1 scenario are converted to relative percentage changes. The percentage change in AADT along all road links is used to estimate the percentage change in road NO<sub>x</sub> between the DM-BR and DMT1 scenarios, and DS-RUC1 and DMT1 scenarios at corresponding relevant monitoring sites. These monitoring sites were assigned to the nearest modelled road link manually. From this, an estimated road NO<sub>x</sub> under the DM-BR and DS-RUC1 scenarios are calculated, and then adjusted using an air quality model adjustment factor of **2.34** derived from an existing validation of the Oxford air dispersion model.

Adjusted road NO<sub>x</sub> under the DM-BR and DS-RUC1 scenarios at relevant monitoring stations was converted to annual mean NO<sub>2</sub> concentrations using Defra’s NO<sub>x</sub> to NO<sub>2</sub> calculator v8.1<sup>1,2</sup>. Total annual mean NO<sub>2</sub> was calculated using inputs of adjusted road NO<sub>x</sub> and total background NO<sub>x</sub> for non-road sources using 2018 reference year background maps for 2025<sup>3</sup>.

The changes in AADT between DM-BR and RUC1, shown as total values and percentage change, for all road links are shown in Section 3.1 of this technical note. The changes in road NO<sub>x</sub> and NO<sub>2</sub> concentrations at relevant monitoring sites are shown in Section 3.2 of this technical note. The changes in AADT, road NO<sub>x</sub> and NO<sub>2</sub> between DM-BR and RUC1 relative to DMT1 is presented in Appendix 1 of this technical note.

### 2.2 LIMITATIONS

The approach taken in this technical note is a reasonable approximation of the change in road NO<sub>x</sub> that is directly proportional to the change in AADT along modelled road links. This short study does not consider:

- The change in vehicle fleet between DM-T1, DM-BR and DS-RUC1 along modelled road links;
- The change in congested vehicle speed along modelled road links.

<sup>1</sup> Defra NO<sub>x</sub> to NO<sub>2</sub> Calculator version 8.1. Available at: <https://aqm.defra.gov.uk/air-quality/air-quality-assessment/nox-to-no2-calculator/>

<sup>2</sup> A newer version of the NO<sub>x</sub> to NO<sub>2</sub> calculator is available, however v8.1 has been used in order to maintain comparability with the existing DMT1 air dispersion modelling results.

<sup>3</sup> Defra 2018 Reference Year Background Maps. Available at: <https://aqm.defra.gov.uk/air-quality/air-quality-assessment/background-maps/>

### 3. RESULTS

#### 3.1 CHANGE IN AADT

Figure 3-1 - change in AADT (as total values) between DS-RUC1 and DM-BR along modelled road links in Oxford. Blue = net decrease in AADT, white = no net change, red = net increase in AADT

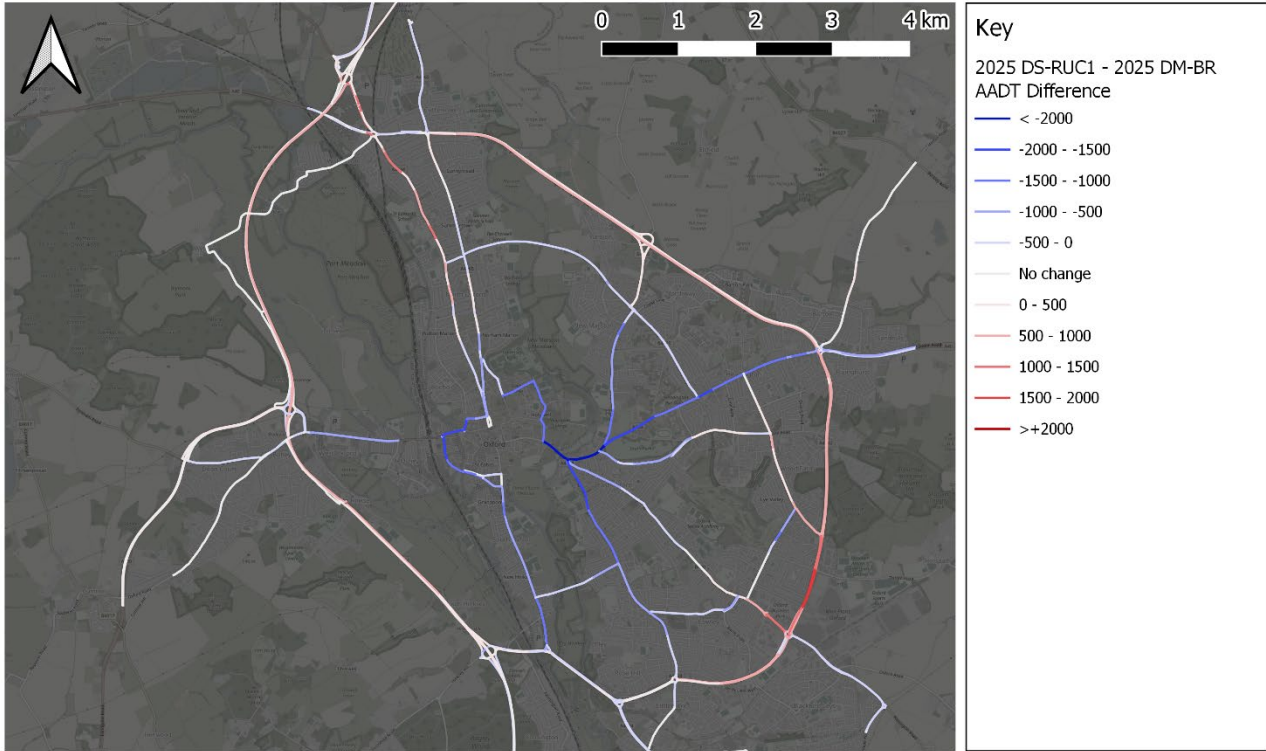
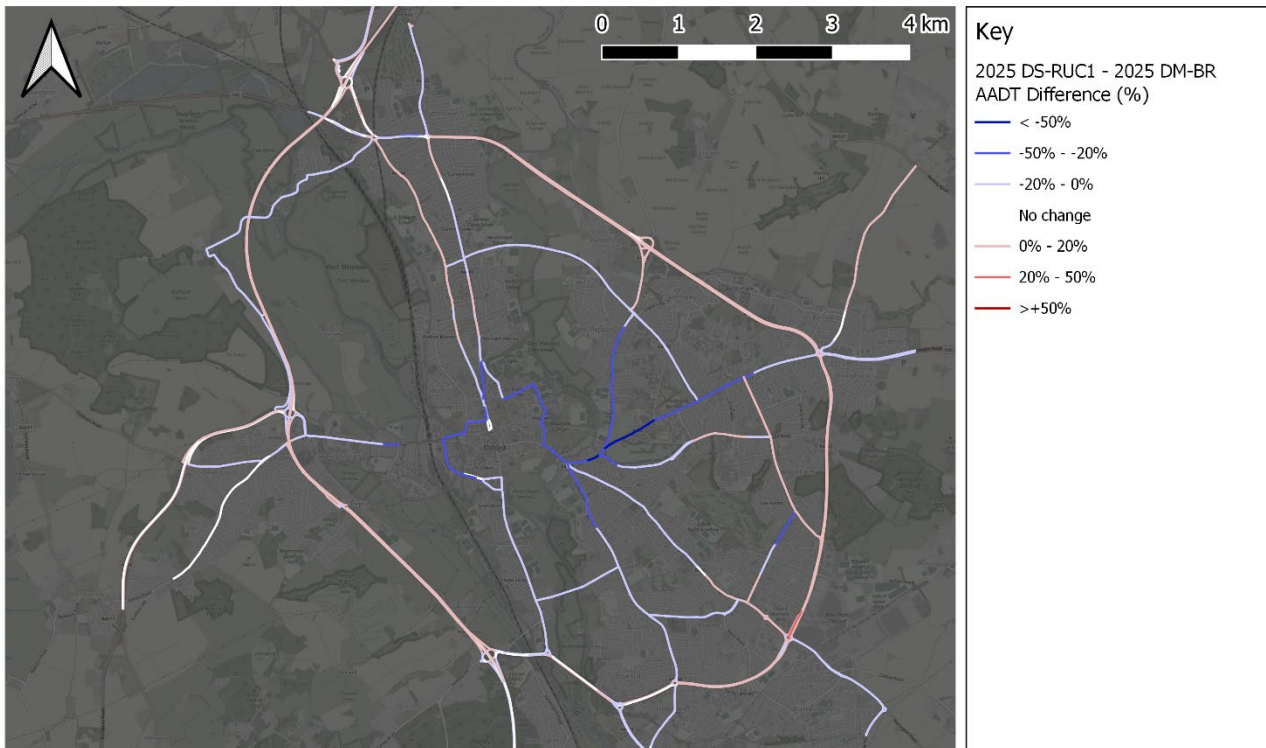


Figure 3-2 - change in AADT (as %) between DS-RUC1 and DM-BR along modelled road links in Oxford. Blue = net decrease in AADT, white = no net change, red = net increase in AADT



### 3.2 CHANGE IN ROAD NO<sub>x</sub> AND NO<sub>2</sub>

As set out in Section 2.1, the impact on road NO<sub>x</sub> and NO<sub>2</sub> is assessed at specific monitoring sites.

The sites selected (Figure 3-3) are of particular interest either due to their proximity to roads with the largest changes in AADT between the DS-RUC1 and DM-BR scenarios (red = increase; green = decrease); or due to their geographic location to gain a diverse representation of monitoring sites (blue = Oxford city centre; cyan = Marston Ferry Road or Hollow Way; yellow = ring road; pink = suburban area of Oxford).

Figure 3-3 – Oxford monitoring sites considered in this technical note

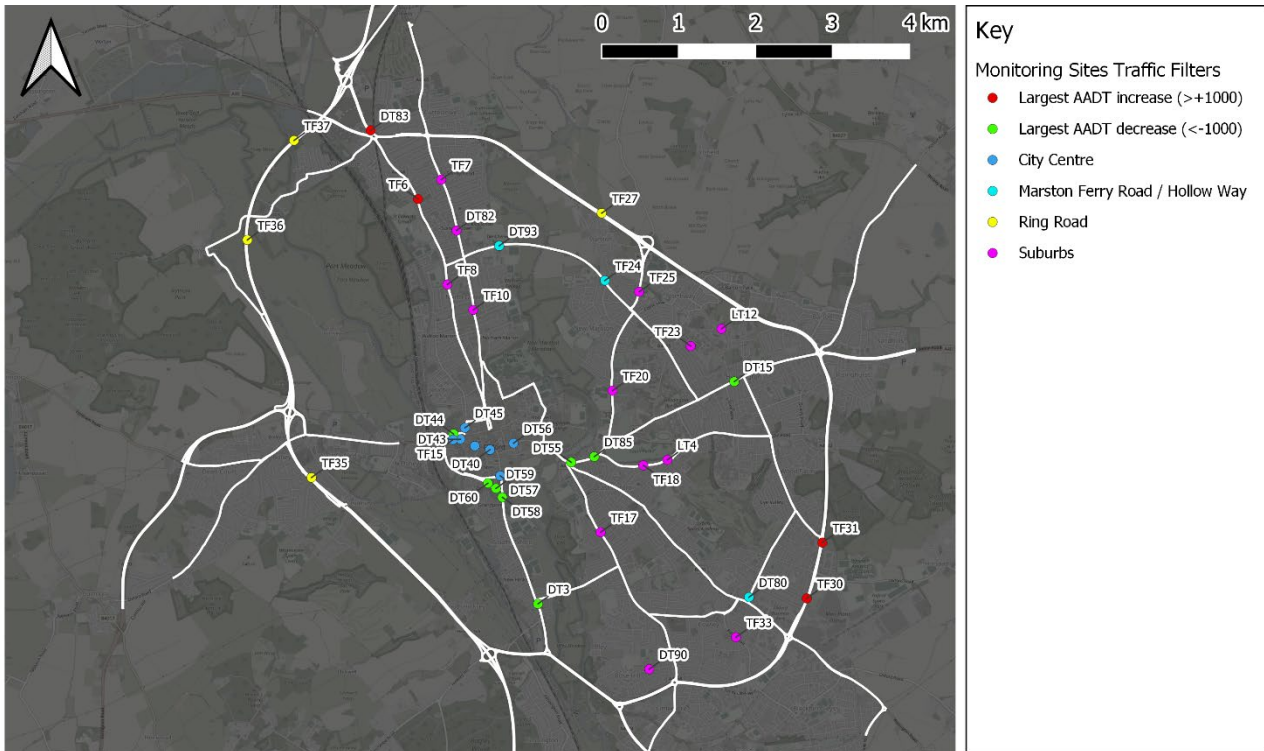


Table 3-1 - change in AADT and NO<sub>2</sub> concentrations (µg/m<sup>3</sup>) between DS-RUC1 and DM-BR. NO<sub>2</sub> concentration changes are estimated and subject to the limitations set out in Section 2.2

Site				DS-RUC1 - DM-BR diff		Estimated annual mean NO <sub>2</sub> concentrations (µg/m <sup>3</sup> )		
Site ID	Site name	Site type	Nearest Road Link	AADT	%	DM-BR	DS-RUC1	NO <sub>2</sub> diff
DT55	St Clements		20045_85157	-4116	-43.4	40.1	28.5	-11.6
DT85	St Clements 3		85157_20400	-4872	-51.2	32.0	21.6	-10.4
DT45	Worcester St.		20290_20092	-1734	-38.0	29.8	23.6	-6.2
DT3	LP 52 Abingdon Rd.	Largest AADT decrease (<-1000)	20071_20070	-1124	-11.8	23.8	22.3	-1.5
DT15	London Rd./BHF		20030_20590	-1290	-28.3	22.1	19.0	-3.1
DT58	Folly Bridge		20074_20075	-1464	-19.2	21.5	19.6	-1.9
DT59	Thames St.		20075_20085	-1464	-19.9	19.9	18.2	-1.7
DT44	Hythe Bridge St.		20092_20091	-1734	-38.0	19.0	16.7	-2.3
DT60	New Butterwyke P./ Thames St.		20075_20085	-1464	-19.9	18.8	17.3	-1.5
TF31	Brasenose Farm/Eastern Bypass	Largest AADT increase (>+1000)	20510_20655	1402	9.2	31.6	33.1	1.5
DT83	A44 Woodstock Rd.		97006_98203	1001	9.5	26.1	27.6	1.5
TF30	99 Oliver Road (Eastern Bypass)		21150_85003	1965	11.3	25.5	27.0	1.5
TF6	306 Woodstock Road		20170_20390	1217	17.0	17.3	18.5	1.2
DT56	High St.		20386_21030	-154	-5.0	18.6	18.2	-0.4
DT57	Speedwell St. / St. Aldate's		20080_85019	-195	-7.1	18.3	17.8	-0.5
TF15	Park End Street	City Centre	20090_20280	-582	-30.4	17.1	15.7	-1.4
DT43	Park End St.		20090_20280	-582	-30.4	15.7	14.7	-1.0
DT42	New Rd.		20275_20285	0	0.0	13.2	13.2	0.0
DT40	Queen St.		20275_21030	0	0.0	12.9	12.9	0.0
DT80	Hollow Way		Marston Ferry Road / Hollow Way	20675_20050	28	0.5	19.1	19.1
DT93	Marston Ferry Rd	20520_21175		-645	-15.4	14.5	13.8	-0.7
TF24	Marston Ferry Rd/Cherwell Drive	20520_21175		-645	-15.4	14.4	13.7	-0.7
TF37	Wolvercote Meadows 2		12185_12175	685	1.8	37.5	38.0	0.5
TF36	Wolvercote Meadows 1	Ring Road	12185_12175	685	1.8	31.2	31.6	0.4
TF35	67 Southern Bypass Road		12275_12040	864	2.8	30.6	31.1	0.5
TF27	Northern Bypass/Phillips Tyres		16305_16010	234	1.5	21.6	21.8	0.2
TF17	23 Iffley Rd/Stanley Rd			85155_20920	-1129	-13.3	21.6	20.2
TF25	39 Marsh Lane		20110_16140	352	4.6	18.3	18.6	0.3
TF8	191 Woodstock Road		21310_85044	722	10.6	17.4	18.1	0.7
TF7	339 Banbury Road		20395_20166	-18	-0.4	15.2	15.2	<-0.1
TF33	119 Barns Road		20730_85135	-367	-11.0	15.1	14.6	-0.5
TF18	143 Morrell Avenue		20415_85161	-187	-6.6	14.2	14.0	-0.2
TF10	99 Banbury Road	Suburbs	20355_20342	189	4.4	14.2	14.3	0.1
LT12	Ruskin Hall		20585_20575	-87	-3.6	14.2	14.0	-0.2
LT4	138-146 Morrell Av		20415_85161	-187	-6.6	13.6	13.4	-0.2
TF20	Marston Rd/St Michaels Primary		85063_85065	-1274	-32.0	13.6	12.6	-1.0
DT82	Summertown Parade		20165_21175	-50	-1.2	13.4	13.3	-0.1
DT90	Rose Hill (Ashhurst Way)		20870_20865	-41	-3.2	13.0	12.9	-0.1
TF23	JR Hospital		20730_85135	-367	-11.0	11.8	11.6	-0.2

A – Colours correspond to the key used to indicate site type in Figure 3-3.

B - Red-Green colour scale indicates relative increases (red) and decreases (green) between RUC1 and DMT1 scenarios.

C - Green-Lime-Yellow-Orange colour schemes indicate annual mean NO<sub>2</sub> concentrations relative to specific thresholds: <20 µg/m<sup>3</sup> (green), 20-25 µg/m<sup>3</sup> (lime), 25-30 µg/m<sup>3</sup> (yellow), 30-40 µg/m<sup>3</sup> (orange).

The changes in annual mean NO<sub>2</sub> concentrations between DS-RUC1 and DM-BR scenarios are presented in Table 3-1, alongside the changes in AADT on the corresponding nearest road link. Appendix 1 presents the full results showing the relative changes to DMT1 and changes in road NO<sub>x</sub> used to calculate the annual mean NO<sub>2</sub> concentrations for DS-RUC1 and DM-BR.

The table also includes the adjusted road NO<sub>x</sub> and NO<sub>2</sub> concentration for the do minimum scenario (DM1), the traffic filter scenario (DMT1) and the congestion charge scenario (RUC1) to give further context on the impact of the proposed congestion charge.

For each of the corresponding site types, it is found that:

- For sites impacted by the **largest AADT decrease**; there is a decrease in total NO<sub>2</sub> across all stations between 1.5 µg/m<sup>3</sup> (DT3, DT6) and 11.7 µg/m<sup>3</sup> (DT55).
- For sites impacted by the **largest AADT increase**, there is an increase in total NO<sub>2</sub> across all stations between 1.2 µg/m<sup>3</sup> (TF6) and 1.5 µg/m<sup>3</sup> (DT83, TF30, TF31).
- For sites within the **city centre**, there is reduction in total NO<sub>2</sub> for the majority of sites between 0.3 µg/m<sup>3</sup> (DT56) and 1.4 µg/m<sup>3</sup> (TF15). There is no change in AADT or NO<sub>2</sub> for two sites (DT40, DT42).
- For the sites at **Hollow Way Road and Marston Ferry Road**, there is a decrease in total NO<sub>2</sub> across both sites on Marston Ferry Road by 0.7 µg/m<sup>3</sup> (DT93, TF24). There is a non-zero increase in NO<sub>2</sub> for the site at Hollow Way Road by <0.1 µg/m<sup>3</sup> (DT80).
- For sites along the **ring road** outside of Oxford, there is an increase in total NO<sub>2</sub> across all stations between 0.2 µg/m<sup>3</sup> (TF27) and 0.5 µg/m<sup>3</sup> (TF35, TF37).
- For sites in **suburban areas** of Oxford, there is a range in the change in total NO<sub>2</sub> between a decrease of 1.4 µg/m<sup>3</sup> (TF17) and an increase of 0.7 µg/m<sup>3</sup> (TF8).

## 4. CONCLUSIONS

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The impacts of implementing a congestion charge as a precursor to the traffic filter scheme (DS-RUC1) has been compared directly with a baseline scenario (DM-BR). In both scenarios, the Botley Road closure has been modelled.

This study found that:

- The greatest **positive impacts** on air quality are observed at monitoring sites DT55 and DT85 along St Clements. It is estimated that AADT decreases between 43 – 51% which results in an estimated NO<sub>2</sub> decrease of 10.4 – 11.6 µg/m<sup>3</sup>. Under the DM-BR scenario, the site DT55 is estimated to be in non-compliance with UK limit values for annual mean NO<sub>2</sub> (>40 µg/m<sup>3</sup>), but will achieve Oxford's local target (<30µg/m<sup>3</sup>) under the DS-RUC1 scenario. Other positive impacts are seen along Abingdon Road to the south of the city centre.
- The greatest **negative impacts** on air quality are observed at monitoring sites along Woodstock Road (DT83, TF6) and along the south-east section of the A4142 Oxford ring road (TF30, TF31). It is estimated that AADT increases by 9 – 17 %, and results in an iNO<sub>2</sub> increase of 1.2 – 1.5 µg/m<sup>3</sup>. The monitoring sites at these locations are not at risk of exceeding annual mean NO<sub>2</sub> limit values under the DS-RUC1 scenario, however site TF31 remains above the Oxford local target of 30 µg/m<sup>3</sup>.
- There is an overall small net benefit on air quality within the **city centre** and **Marston Ferry Road**. This suggests that the congestion charge (DS-RUC1) does not negatively impact these areas. There are some sites within the city centre (DT40, DT42) and **Hollow Way Road** (DT80) where there are negligible impacts on NO<sub>2</sub> concentrations.
- All sites around the **ring road** are expected to increase in NO<sub>2</sub> concentrations by a maximum of 1.5 µg/m<sup>3</sup>. However, it is likely that human exposure at these sites is relatively lower compared to sites that are expected to have the greatest improvements in air quality (e.g. St Clements).
- The impacts on **suburbs** vary by location, but the majority of sites are expected to receive relatively small impacts by a change in NO<sub>2</sub> of ±1 µg/m<sup>3</sup>.





