

NO_x to NO₂ Calculator

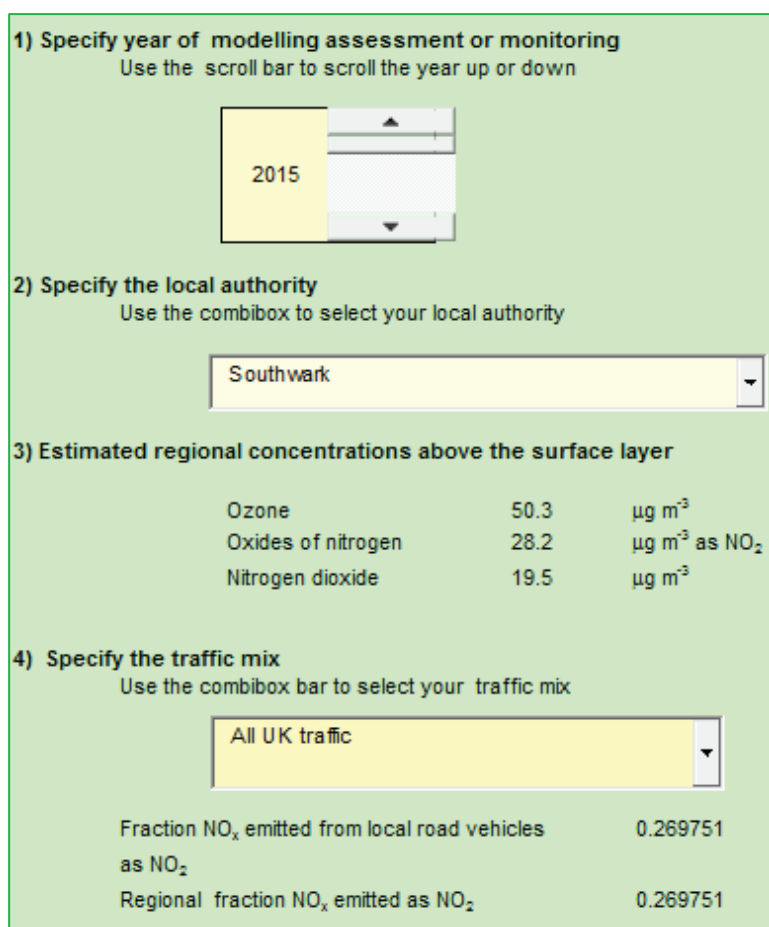
This calculator allows local authorities to derive NO₂ from NO_x wherever NO_x is predicted by modelling emissions from roads. The calculator can also be used to calculate the road component of NO_x from roadside NO₂ diffusion tube measurements.

The latest version of the tool (Version 6.1), which replaces Version 5.1, includes updated estimates of regional concentrations of NO_x, NO₂ and O₃ above the surface layer, and fractions of vehicle NO_x emissions emitted directly as NO₂ (f-NO₂) from the NAEI, consistent with the [2017 NO₂ Air Quality Plan](#)⁵. It also provides the ability to include user defined f-NO₂ values (e.g. those estimated by the Primary NO₂ Fraction Advanced Option of the Emissions Factors Toolkit EFT v8), in place of the provided default values.

Version 6.1 of the tool should only be used with the 2015 reference year background map concentrations and the EFT v8, and can be used for years 2015 to 2030.

The latest version of the tool can be downloaded from the [LAQM website](#)¹⁴.

General Inputs:



1) Specify year of modelling assessment or monitoring
Use the scroll bar to scroll the year up or down

2015

2) Specify the local authority
Use the combobox to select your local authority

Southwark

3) Estimated regional concentrations above the surface layer

Ozone	50.3	µg m ⁻³
Oxides of nitrogen	28.2	µg m ⁻³ as NO ₂
Nitrogen dioxide	19.5	µg m ⁻³

4) Specify the traffic mix
Use the combobox bar to select your traffic mix

All UK traffic

Fraction NO _x emitted from local road vehicles as NO ₂	0.269751
Regional fraction NO _x emitted as NO ₂	0.269751

¹⁴ <http://laqm.defra.gov.uk/review-and-assessment/tools/background-maps.html#NOxNO2calc>

1. Specify the year of the modeling assessment or diffusion tube measurements.
2. Select the local authority: the spreadsheet will provide an estimate of the regional O₃, NO_x and NO₂ concentrations above the surface layer. These provide information about the amount of oxidant available in the atmosphere.
3. Specifying a representative traffic mix: the spreadsheet will estimate the fraction of vehicle NO_x emissions emitted as NO₂ (f-NO₂).

The traffic mix dropdown box contains six options:

- All UK traffic;
- All London traffic;
- All other urban UK traffic;
- All non-urban UK traffic;
- Buses outside London; and
- Buses in London.

The descriptors “urban” and “non-urban” are based upon the DfT’s definition: an urban road is a road within an urban area with a population of 10,000 or more. However, traffic on motorways within urban areas, including London, should be considered separately. It is also recognized that study areas (and roads) which cross more than one area definition are difficult to include. The following is advised:

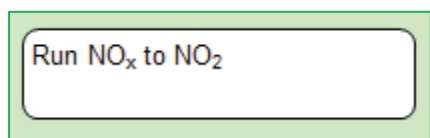
- “*All UK traffic*” should only be used if none of the other options given below are suitable for your data.
- “*All London traffic*” can be used anywhere in London except adjacent to motorways or where buses dominate the vehicle fleet.
- “*All other urban UK traffic*” is an average of all urban roads outside of London, excluding motorways in urban areas. If your receptors or diffusion tubes are in an urban area and not near to motorways, you can use this option.
- “*All non-urban UK traffic*” gives a national average of traffic on non-urban roads and all motorways. If your receptors or diffusion tubes are outside of urban areas or near to any motorway, even in urban areas, you can use this option.
- “*Buses outside London*” can be used outside London where buses dominate your local fleet.
- “*Buses in London*” can be used inside London where buses dominate your local fleet.

In some situations you may have sufficiently detailed information to calculate your own "f-NO₂" value. The EFT v8 now provides an estimate the Primary Fraction of NO₂ (f-NO₂) using the Primary NO₂ Fraction Advanced Option - f-NO₂ values are provided at the individual link level and also as a weighted average according to the contribution each vehicle type makes to total NO_x emissions from traffic associated with all links entered as input in to the EFT. The f-NO₂ values for each vehicle type that are employed as part of the calculation are consistent with those applied on the NAEI.

When you enter user defined f-NO₂ values directly into the calculator, you do not need to specify a traffic mix under "General Inputs".

NO_x to NO₂ Tab:

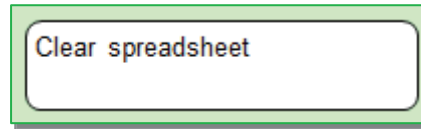
- 1) Confirm that the General inputs spreadsheet has been completed.
- 2) Type in:
 - A Receptor ID and its Easting and Northing (Optional);
 - The modelled contribution from roads to oxides of nitrogen concentrations (Road increment NO_x); and
 - The local background concentration as NO₂ (2 decimal places). You may alternatively enter the local background as NO_x, as the calculations are faster if you input background NO_x rather than background NO₂. Leave the redundant background NO_x or NO₂ columns blank as appropriate .
- 3) The default set-up is to use the fraction of oxides emitted as NO₂ from the General Inputs spreadsheet. We recommend a majority of users therefore leave the "Fraction emitted as NO₂" column empty to use the default set up. However, you can overwrite the defaults by typing appropriate values (0-1) into this column. The f-NO₂ tab provides additional values.
- 4) Click the 'Run NO_x to NO₂' button to run the tool, which will then calculate:
 - The total nitrogen dioxide concentration at the receptor (Total NO₂); and
 - The incremental contribution to nitrogen dioxide concentrations from the road vehicle emissions (Road NO₂).



- 5) An example of indicative inputs and output results is provided below (note these values are for the purposes of this example only):

Local Authority:			Southwark			Year:		2015			
						Traffic Mix:		All London traffic			
Receptor ID	Easting, m	Northing, m	Road increment NO _x µg m ⁻³	Background µg m ⁻³		Fraction emitted as NO ₂ (fNO2)		Total NO ₂ µg m ⁻³	Road NO ₂ µg m ⁻³	Notes	
				NO _x	NO ₂						
1	531500	180500	46.13		47.69			64.55	16.86		

6) Click on the 'Clear spreadsheet' button to clear the spreadsheet to run new results.



Diffusion Tubes Tab:

- 1) Confirm that the General inputs spreadsheet has been completed.
- 2) Type in:
 - *The site identifier (Site ID) [Optional];*
 - *The nitrogen dioxide concentration measured by the diffusion tube (Diffusion tube NO₂); and*
 - *The local background concentration as NO₂. You may alternatively enter the local background as NO_x. Leave the redundant background NO_x or NO₂ columns blank as appropriate.*
- 3) Hit the 'Run' button to run the tool. The tool will calculate the incremental contribution to oxides of nitrogen concentrations from the road vehicle emissions (Road NO_x).
- 4) See below an example of indicative results (note these values are for the purposes of this example only):

Local Authority:			Southwark			Year:		2015			
						Traffic Mix:		All London traffic			
Site ID	Diffusion tube NO ₂ , µg m ⁻³	Background µg m ⁻³		Road NO _x , µg m ⁻³	Fraction emitted as NO ₂ (fNO2)		Notes				
		NO _x	NO ₂								
1	59.24		47.69	30.41							

4) Hit the 'Clear' button to clear the spreadsheet and run new inputs.

Year Adjustment Factors

Year adjustment factors are not required for 2015 reference year background maps because maps are available for all years 2015-2030.

The Year Adjustment Factors published in the 2003 Technical Guidance LAQM TG(03) may still be used for projecting 2001-based background concentrations of carbon monoxide, benzene and 1,3-butadiene ONLY. These are available in the [2001 Year Adjustment Factors Spreadsheet](#)¹⁵.

Users are reminded that the factors applied to forecasting measured annual mean roadside NO₂ and PM₁₀ concentrations to future years differ to those discussed above. Further information is available on the [LAQM website](#)¹⁶.

¹⁵ <https://laqm.defra.gov.uk/documents/yearfactorslaqm2001.xls>

¹⁶ <https://laqm.defra.gov.uk/tools-monitoring-data/year-adjustment-factors.html>