Riverside Energy Park

Preliminary Environmental Information Report

APPENDIX:

C.2

PLANNING INSPECTORATE REFERENCE NUMBER:

EN010093

GLOSSARY AND BACKGROUND CONCENTRATIONS

June 2018 | Revision 0

Planning Act 2008 | Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009

CORY
RIVERSIDE ENERGY

Riverside Energy Park

Air Quality Appendix C2

C2.1 Glossary

Abbreviations	Meaning
AADT	Annual Average Daily Traffic
ADMS	Air Dispersion Modelling System
AQAP	Air Quality Action Plan
AQA	Air Quality Assessment
AQMA	Air Quality Management Area
BEB	Building Emission Benchmark
CAZ	Central Activity Zone
CHP	Combined Heat and Power
DEFRA	Department for Environment, Food and Rural Affairs
Diffusion Tube	A passive sampler used for collecting NO_2 in the air
EC	European Commission
EFT	Emission Factor Toolkit
EPUK	Environmental Protection UK
GIA	Gross Internal Area
GLA	Greater London Authority
HDV	Heavy Duty Vehicle; a vehicle with a gross vehicle weight greater than 3.5 tonnes, includes Heavy Goods Vehicles and buses
IAQM	Institute of Air Quality Management
LAEI	London Atmospheric Emissions Inventory
LAQM	Local Air Quality Management
LEZ	Low Emission Zone
LGV	Light Good Vehicle
NAQO	National Air Quality Objective as set out in the Air Quality Strategy and the Air Quality Regulations
NO_2	Nitrogen Dioxide

Abbreviations	Meaning
NO_X	Nitrogen oxides, generally considered to be nitric oxide and NO_2. Its main source is from combustion of fossil fuels, including petrol and diesel used in road vehicles
NPPF	National Planning Policy Framework
NRMM	Non-road mobile machinery
PM_{10}	Small airborne particles less than 10 µm in diameter
PBA	Peter Brett Associates LLP
PPG	Planning Practice Guidance
Receptor	A location where the effects of pollution may occur
SPG	Supplementary Planning Guidance
SQM	Square Metres
TEB	Transport Emission Benchmark

C2.2 Background Concentrations

Introduction

DEFRA publish details of estimated background concentrations of pollutants for each 1km grid square across the country. The London Borough of Barking and Dagenham and London Borough of Bexley run a suburban/urban background monitoring sites within approximately 5 km from Riverside Energy Park. In order to more accurately reflect background concentrations across the study area, DEFRA mapped background concentrations have been compared against concentrations measured in 2016 to produce a calibration factor which is applied to background concentrations across the study area.

Nitrogen Dioxide

Location	Measured NO_2 (µg/m^3)	Defra Background (µg/m^3)	Calibration Factor
BX2 Belvedere Primary School	29.0	20.4	1.419
BX1 Slade Green	25.0	19.1	1.310
BQ7 Bexley Business Academy	24.0	18.4	1.303
BG2 Scrattons Farm	32.1	19.5	1.644
Average	-	-	**1.344**

This factor has been applied to the mapped background for both baseline and future year scenarios across the study area.

PM_{10} and $PM_{2.5}$

Location	Measured PM_{10} (µg/m^3)	Defra Background (µg/m^3)	Calibration Factor
BX2 Belvedere Primary School	14.0	15.7	0.890
BX1 Slade Green	18.0	16.1	1.120
BQ7 Bexley Business Academy	15.0	15.3	0.980
BG2 Scrattons Farm	20.09	15.7	1.282
Average	-	-	**0.997**

This factor has been applied to the mapped background for both baseline and future year scenarios across the study area.

The calibration factor used for PM_{10} has also been applied to $PM_{2.5}$ backgrounds

C2.3 Model Inputs and Results Processing Tools

Table C2.3.1: Model Inputs

Meteorological Data	Hourly meteorological data for London City for 2016 has been used in the model. The wind-rose is shown in figure 7.2.1.
ADMS	Version 4.1.1
Latitude	51º
Surface Roughness	A value of 0.5 for Parkland and Open Suburbia was used to represent the modelled area. A value of 1 for Cities and Woodlands was used to represent the meteorological station site.
Minimum Monin-Obukhov length	A value of 100 for Large Conurbations was used to represent the modelled area and meteorological station site.
Street Canyon	ADMS Urban Canopy module was used to represent the effect of the urban area on wind speeds and dispersion.
Emission Factor Toolkit (EFT)	V8.0, November 2017.
NO_x to NO_2 Conversion	NO_x to NO_2 calculator version 6.1, 17 October 2017
Background Maps	2015 reference year background maps

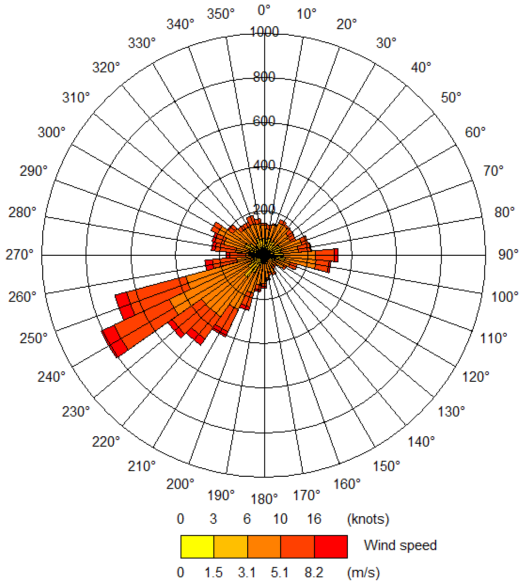

Figure C2.3.1: London City 2016 windrose

C2.4 Model Verification

Nitrogen Dioxide

Most nitrogen dioxide is produced in the atmosphere by the reaction of nitric oxide (NO) with ozone. It is therefore most appropriate to verify the model in terms of primary pollutant emission of nitrogen oxides (NO_x = NO + NO_2). The model has been run to predict the 2016 annual mean road-NO_x contribution at the HAV50 and HV1 roadside diffusion tube and automatic monitor, both located within the London Borough of Havering and within our study area. These are considered to be the most appropriate locations given their location and distance from significant sources. Concentrations have been modelled at the height of each monitoring location.

The model output of road-NO_x has been compared with the 'measured' road-NO_x, which was calculated from the measured NO_2 concentrations and the adjusted background NO_2 concentrations within the NO_x from NO_2 calculator.

A primary adjustment factor was determined as the slope of the best fit line between the 'measured' road contribution and the model derived road contribution, forced through zero (**Figure C2.4.1**). This factor was then applied to the modelled road-NO_x concentration for each monitoring site to provide adjusted modelled road-NO_x concentrations. The total nitrogen dioxide concentrations were then determined by combining the adjusted modelled road-NO_x concentrations with the predicted background NO_2 concentration within the NO_x from NO_2 calculator. A secondary adjustment factor was finally calculated as the slope of the best fit line applied to the adjusted data and forced through zero (**Figure C2.4.2**).

The following primary and secondary adjustment factors have been applied to all modelled nitrogen dioxide data:

Primary adjustment factor:	2.3205
Secondary adjustment factor:	0.9998

The results imply that overall, the model was under-predicting the road-NO_x contribution. This is a common experience with this and most other models. The final NO_2 adjustment is minor.

Figure C2.4.3 compares final adjusted modelled total NO_2 at each of the monitoring sites, to measured total NO_2, and shows the 1:1 relationship, as well as ±10% and ±25% of the 1:1 line.

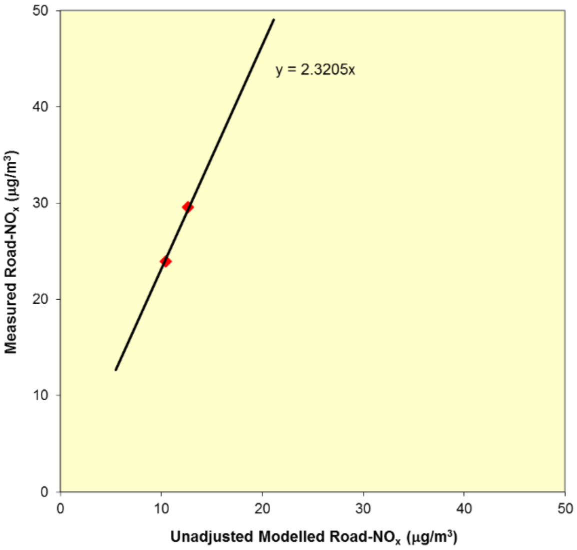

Figure C2.4.1: Comparison of Measured Road-NO_x with Unadjusted Modelled Road-NO_x Concentrations

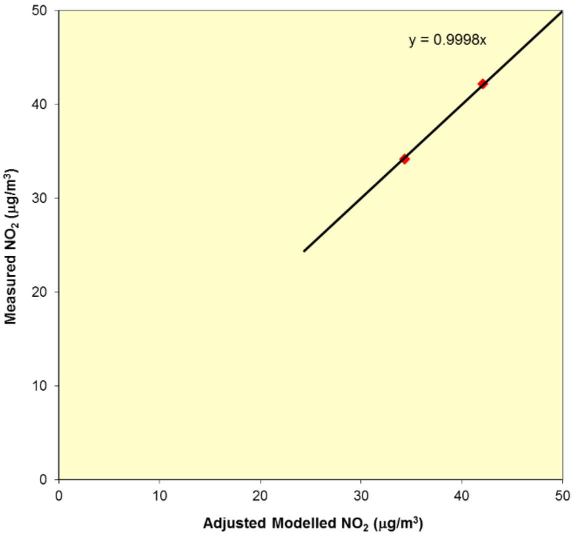

Figure C2.4.2: Comparison of Measured NO_2 with Primary Adjusted Modelled NO_2 Concentrations

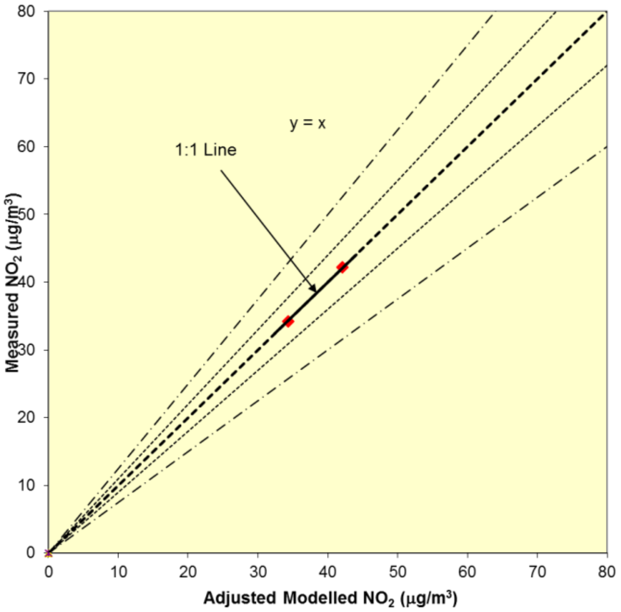

Figure C2.4.3: Comparison of Measured NO_2 with Fully Adjusted Modelled NO_2 Concentrations

PM_{10}

The HV1 Automatic monitoring station is the only roadside location within the study area that monitors PM_{10}. This has therefore been used to calculate a verification factor for PM_{10} following a similar methodology as that used for nitrogen dioxide.

Road PM_{10} (calculated from Measured PM_{10} at the HV1 monitoring site and calibrated background PM_{10} for the appropriate grid-square) is divided by the modelled road PM_{10} to produce a factor which can be applied to PM_{10} model outputs.

Measured PM_{10} (18.6 µg/m^3) - Calibrated background PM_{10} (15.3 µg/m^3) = Measured Road PM_{10} (3.3 µg/m^3)

Measured Road PM_{10} / Modelled Road PM_{10} (0.61 µg/m^3) = PM_{10} verification factor (5.472).

$PM_{2.5}$

The HV1 Automatic monitoring station is the only roadside location within the study area that monitors $PM_{2.5}$. This has therefore been used to calculate a verification factor for $PM_{2.5}$ following a similar methodology as that used for nitrogen dioxide.

Road $PM_{2.5}$ (calculated from Measured $PM_{2.5}$ at the HV1 monitoring site and calibrated background $PM_{2.5}$ for the appropriate grid-square) is divided by the modelled road $PM_{2.5}$ to produce a factor which can be applied to $PM_{2.5}$ model outputs.

Measured $PM_{2.5}$ (12.2 µg/m^3) - Calibrated background $PM_{2.5}$ (10.1 µg/m^3) = Measured Road $PM_{2.5}$ (2.02 µg/m^3)

Measured Road $PM_{2.5}$ / Modelled Road $PM_{2.5}$ (0.38 µg/m^3) = $PM_{2.5}$ verification factor (5.31).

C2.5 Traffic Data

Location	2016 Baseline		2024 Baseline		2024 With Development	
	AADT	HDV (%)	AADT	HDV (%)	AADT	HDV (%)
Yarnton Way (West Alsike Rd)	7,995	6.9	8207	6.8	8207	6.8
Yarnton Way (East Alsike Rd)	7,873	5.5	8084	5.4	8084	5.4
Picardy Manorway (West)	20400	8.7	21967	8.9	22400	10.6
Picardy Manorway (South)	7,388	5.1	7586	4.9	7586	4.9
Wennington Road (East Lambs Ln)	2,320	7.5	2398	7.2	2398	7.2
Wennington Road (East Ferry Ln)	18,286	9.4	18847	10.6	18847	10.6
Lamb's Lane South	6,446	9.7	6638	9.2	6638	9.2
Ferry Lane	7,733	15.0	7941	14.2	7941	14.2
Broadway (West Ferry Ln)	38,310	7.1	39538	6.7	39538	6.7
Bronze Age Way	32593	9.2	36090	9.2	36390	9.8
A13	40,799	11.7	43261	10.9	43261	10.9
Heathway	14591	8.7	15330	8.3	15330	8.3
Ripple Road (West Merrielands Crescent)	38304	10	40141	9.4	40141	9.4
Ripple Road (East Merrielands Crescent)	24,038	7.5	25259	7.0	25259	7.0
New Road (West Thames Av)	17,935	9.4	18500	8.9	18500	8.9
New Road (West Kent Av)	13,749	13.1	14398	12.4	14398	12.4
New Road (West Cherry Tree Ln)	17,766	8.5	18329	8.1	18329	8.1
New Road (East Cherry Tree Ln)	17,671	8.0	18234	7.6	18234	7.6
Marsh Way	19,118	8.7	21043	8.7	21043	8.7
New Road (By Upminster Rd)	20,796	5.3	21488	5.0	21488	5.0
A13 (by Marsh Way)	77,222	10.1	82020	9.3	82020	9.3
Upminister Road South	1,972	26.6	2023	25.8	2023	25.8
Cherry tree lane	6,120	7.7	6325	7.5	6325	7.5
A206 Bob Dunn Way	24512	13.2	27890	12.8	28190	13.6

C2.6 Traffic Emissions Predicted Concentrations

Human Health Receptors

Table C2.6.1: Predicted Baseline Concentrations of NO_2, PM_{10} and $PM_{2.5}$ at Existing Receptors

Receptor	Annual Mean (µg/m^3)					
	2016 Baseline			2024 Future Baseline		
	NO_2	PM_{10}	$PM_{2.5}$	NO_2	PM_{10}	$PM_{2.5}$
R1	25.3	15.5	10.2	19.8	14.9	9.6
R2	30.3	16.7	11.0	23.2	16.0	10.3
R3	27.4	16.3	10.6	21.1	15.7	10.0
R4	27.9	17.1	11.2	21.2	16.4	10.5
R5	27.7	15.3	10.1	22.1	14.7	9.5
R6	23.6	15.9	10.5	18.5	15.3	9.9
R7	39.8	20.2	13.0	29.6	19.2	12.0
R8	37.9	18.5	12.0	27.8	17.6	11.2
R9	27.8	16.2	10.6	21.1	15.5	9.9
R10	25.3	16.0	10.4	19.3	15.4	9.8
R11	**43.2**	20.6	13.3	31.2	19.6	12.2
R12	35.9	18.3	11.7	25.7	17.5	11.0
R13	39.3	18.5	12.0	29.3	17.6	11.1
R14	**45.1**	21.0	13.4	31.6	19.9	12.3
R15	**41.8**	19.4	12.6	30.2	18.5	11.6
R16	25.3	15.4	10.2	19.8	14.8	9.6
R17	27.7	15.3	10.1	22.1	14.7	9.5
R18A 1st	32.0	17.4	11.4	24.4	16.6	10.6
R8B	**41.6**	20.2	13.0	30.3	19.1	12.0
R16B	26.7	16.0	10.5	20.7	15.3	9.8
R19A 1st	31.6	17.4	11.4	24.0	16.6	10.6
R19B 6th	28.4	16.0	10.6	22.0	15.3	9.9
R18B 4th	28.0	16.1	10.6	22.1	15.4	9.9
R20A GF	31.0	17.0	11.1	23.7	16.2	10.4
R20B 5th	27.5	15.9	10.5	21.8	15.3	9.8
R21	**49.9**	25.7	16.0	34.7	24.5	14.7
R23	33.8	19.9	12.8	25.4	19.2	12.0
R24	**40.2**	22.2	14.1	29.5	21.5	13.2
R25	36.8	20.5	13.1	27.1	19.9	12.3
R26	27.1	15.7	10.3	20.9	15.1	9.7
R27	37.3	26.0	16.9	26.9	25.0	15.8
R22	30.9	16.9	11.1	23.5	16.1	10.3
Objectives	**40**	**40**	**25**	**40**	**40**	**25**

Table C2.6.2: Predicted Concentrations of NO_2, PM_{10} and $PM_{2.5}$ at Existing Receptors without (DM) and with (DS) the Development in Place.

Receptor	**2024 Annual Mean (µg/m^3)**								
	NO_2			**PM_{10}**			**$PM_{2.5}$**		
	DM	**DS**	**Change**	**DM**	**DS**	**Change**	**DM**	**DS**	**Change**
R1	19.8	14.9	0.00	14.9	14.9	0.00	9.6	9.6	0.00
R2	23.2	16.0	0.01	16.0	16.0	0.01	10.3	10.3	0.01
R3	21.1	15.7	0.00	15.7	15.7	0.00	10.0	10.0	0.00
R4	21.2	16.4	0.00	16.4	16.4	0.00	10.5	10.5	0.00
R5	22.1	14.7	0.00	14.7	14.7	0.00	9.5	9.5	0.00
R6	18.5	15.3	0.00	15.3	15.3	0.00	9.9	9.9	0.00
R7	29.6	19.2	0.00	19.2	19.2	0.00	12.0	12.0	0.00
R8	27.8	17.6	0.00	17.6	17.6	0.00	11.2	11.2	0.00
R9	21.1	15.5	0.00	15.5	15.5	0.00	9.9	9.9	0.00
R10	19.3	15.4	0.00	15.4	15.4	0.00	9.8	9.8	0.00
R11	31.2	19.6	0.00	19.6	19.6	0.00	12.2	12.2	0.00
R12	25.7	17.5	0.00	17.5	17.5	0.00	11.0	11.0	0.00
R13	29.3	17.6	0.00	17.6	17.6	0.00	11.1	11.1	0.00
R14	31.6	19.9	0.00	19.9	19.9	0.00	12.3	12.3	0.00
R15	30.2	18.5	0.00	18.5	18.5	0.00	11.6	11.6	0.00
R16	19.8	14.8	0.00	14.8	14.8	0.00	9.6	9.6	0.00
R17	22.1	14.7	0.00	14.7	14.7	0.00	9.5	9.5	0.00
R18A 1st	24.4	16.6	0.00	16.6	16.6	0.00	10.6	10.6	0.00
R8B	30.3	19.1	0.00	19.1	19.1	0.00	12.0	12.0	0.00
R16B	20.7	15.3	0.00	15.3	15.3	0.00	9.8	9.8	0.00
R19A 1st	24.0	16.7	0.09	16.6	16.7	0.09	10.6	10.7	0.05
R19B 6th	22.0	15.3	0.01	15.3	15.3	0.01	9.9	9.9	0.01
R18B 4th	22.1	15.4	0.00	15.4	15.4	0.00	9.9	9.9	0.00
R20A GF	23.7	16.2	0.00	16.2	16.2	0.00	10.4	10.4	0.00
R20B 5th	21.8	15.3	0.00	15.3	15.3	0.00	9.8	9.8	0.00
R21	34.7	24.5	0.00	24.5	24.5	0.00	14.7	14.7	0.00
R23	25.4	19.3	0.09	19.2	19.3	0.09	12.0	12.0	0.05
R24	29.5	21.6	0.13	21.5	21.6	0.13	13.2	13.3	0.07
R25	27.1	20.0	0.10	19.9	20.0	0.10	12.3	12.4	0.05
R26	20.9	15.1	0.00	15.1	15.1	0.00	9.7	9.7	0.00
R27	26.9	25.1	0.07	25.0	25.1	0.07	15.8	15.9	0.04
R22	23.5	16.1	0.00	16.1	16.1	0.00	10.3	10.3	0.00
Objectives	**40**		**-**	**40**		**-**	**25**		**-**

C2.7 Future Year Emissions Calculations

Introduction

Atmospheric dispersion modelling is used to determine the effect of future development traffic on local air quality. The modelling utilises predictions of the composition and emissions profile of the vehicle fleet which are produced by Defra in the emissions factor toolkit (EFT). The composition and emissions profiles are provided on a year by year basis from 2013 to 2030, with the database being periodically updated.

The main issue with regard to the modelling of future traffic impacts is the choice of emission factors to use given that there is a degree of uncertainty as to the accuracy of the emission factors, as well as uncertainty introduced by the modelling process and the traffic data on which the predictions are based. This has become more important in recent years as it has been realised that previous versions of the EFT were likely to have significantly underestimated the real world emissions of the vehicle fleet, as well as the more recent revelations concerning the use of ‘defeat devices’ on VW group vehicles.

This note therefore sets out PBAs approach to the choice of vehicle emission factors for future year assessments. The note has been revised following updating of the Defra Emissions Factor Toolkit in November 2017.

Modelling Methodology

As a prelude to the discussion of emission factors, it is useful to recap on the general methodology that is used for dispersion modelling of road traffic emissions:

- Traffic data are entered into the dispersion model to represent the baseline situation and the model is used to predict how NO_x emissions are dispersed in the environment.
- The dispersion modelling predictions are compared to monitoring data to obtain a verification factor; the factor by which the predicted road traffic concentration must be multiplied by to agree with the monitored concentration.
- The modelling is repeated for the future year situation; with traffic data representing the situation without the development in place (the ‘without’ scheme scenario) and with the development in place (‘with’ scheme). In both cases, the verification factor obtained from the baseline modelling is used to multiply the model results by, in essence assuming that the model is equally as accurate in the future as it was for the baseline scenario.

The verification factor is one of the key elements in the discussion regarding vehicle emission factors. One element of uncertainty in the modelling is the degree to which the emission factors in the EFT are different to actual emissions of the vehicle fleet on the local road network. The use of the verification factor for the future year predictions essentially assumes that the difference between the EFT emission factors and real world emissions is the same in the future as it was in the baseline year. In other words, unless there is some reason to believe that the future year emission factors are less accurate than the baseline year emission factors, the degree to which the EFT emission factors and real world emission factors differ is taken into account in the modelling by the use of the verification factor. This is discussed further in the following sections.

Emission Factor Toolkit

The EFT contains estimates of the future composition of the vehicle fleet in terms of the age and type of vehicles. The composition of the vehicle fleet is primarily related to the age of the vehicles (in terms of their emissions class) and the fuel that they use (i.e. petrol or diesel). In general terms, the majority of new vehicles replace much older vehicles, and as the emissions performance of vehicles is generally taken to improve over time, both current and historical versions of the EFT predict very large reductions in NO_x emissions in the future. It is also obvious that the further one looks into the future, the more uncertain the predictions become as they depend on the rate of vehicle renewal and the size and fuel mix of the vehicles bought; which are all estimates.

The emissions performance of the vehicles is classified in terms of Euro type approval testing; Euro 1 to 6 concerning light duty vehicles and Euro I to VI heavy duty vehicles. Whilst the introduction of each Euro class has generally seen a tightening of emission standards, the standards up until now have been based on laboratory testing of vehicles. The emissions performance of the vehicles in real world driving conditions has been higher than the laboratory testing results, especially for diesel vehicles. This factor was not recognised in earlier versions of the EFT, and combined with the fact that diesel vehicles have much higher NO_x emissions than petrol vehicles and there has been a very large increase in the number of diesel vehicles on the road, has meant that the NO_x emissions and NO_2 concentrations have not reduced as previously predicted.

The trends in NO_x emissions in the vehicle fleet, especially diesel vehicles and the accuracy of the current version of the EFT, is therefore critical in terms of the choice of emission factors in modelling.

Trends in NO_x emissions

For light duty vehicles, the latest Euro standard is Euro 6, which was introduced from September 2015 (with a derogation in the UK for the registration of new vehicles until September 2016).

The emissions standards currently relate to a laboratory test whereby the average emission rate is calculated over an idealised drive cycle. The cycle used is the New European Drive Cycle (NEDC) and there has been extensive criticism that the drive cycle does not represent real world driving conditions. It has therefore been agreed that a new drive cycle will be introduced, the World Light-duty Test Cycle (WLDTC), as well as an on-road test termed Real Driving Emissions (RDE).

Up until September 2017, Euro 6 vehicles were only tested in the laboratory against the NEDC, and these vehicles are termed Euro 6ab. However, from September 2017, new models are tested against the WLDTC and will also have a RDE test. The initial introduction of the RDE test will allow vehicles to have average RDE test emissions of 2.1 times the WLDTC test standard. The 2.1 factor is termed the conformity factor and will apply to new vehicle models from September 2017 and all new vehicles from September 2019. From January 2020, the conformity factor will reduce to 1.5 for new vehicle models (January 2021 for all new vehicles).

Air Quality Consultants undertook some research into the performance of diesel vehicles to support a methodology that they have adopted for undertaking air quality assessments[1]. As part of the analysis, they compared the real word test results of current Euro 6ab diesel vehicles and calculated an average conformity factor of 3.9 from the tests that were assessed. This work led to AQC publishing the CURED v2A calculator which attempted to take account of the real world emissions performance of diesel vehicles. The approach using CURED v2A was generally accepted to be conservative when considering developments a long time in the future.

Subsequently, the Department for Transport have undertaken testing of Euro 5 and 6ab diesel vehicles and found that the average NO_x emissions were 1135 mg/km for Euro 5 vehicles and 500 mg/km for Euro 6ab vehicles[2]. These work out to be a conformity factor of 6.30 and 6.25 for Euro 5 and Euro 6ab respectively. Adding in the DfTr results to the AQC results gives an overall average conformity factor for Euro 6ab vehicles tested of 4.1.

A paper presented by Dr Marc Stettler at the recent Westminster Energy, Environment & Transport Forum[3] included results of RDE testing of existing Euro 6ab vehicles. Whilst there was wide range in the results, a number of the vehicles tested did already comply with the Euro 6c standard.

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[1] Emissions of Nitrogen Oxides from Modern Diesel Vehicles. AQC January 2016

[2] Vehicle Emissions Testing Programme DfTr Cm 9259 April 2016

[3] Priorities for reducing air quality impacts of road vehicles. Dr Marc Stettler 17th May 2016

Similar results have been reported in a study led by Rosalind O'Drscoll of Imperial College[4]. This showed that the average NO_x emissions were 4.5 times higher than the Euro 6 limit, with an average NO_2 percentage of 44%.

From the emissions testing work undertaken to date on Euro 6ab vehicles it is clear that the NO_x emissions performance of Euro 6ab vehicles is significantly better than Euro 5 vehicles, although not in line with the laboratory standards. The introduction of Euro 6 should therefore see a significant reduction in NO_x emissions in the future, as outlined in the following table.

Emission Standard	**Real Driving Emissions NO_x mg/km**
Euro 5, DfTr testing	1135
Euro 6ab, DfTr testing	500
Euro 6c, September 2017 models	168
Euro 6c, January 2020 models	120

Further testing of vehicles is ongoing, with Emissions Analytics regularly publishing the results of real world emissions testing on vehicles[5]. Also, in the November 2017 budget, the government announced a one-off tax on new diesel cars not meeting Euro 6c standards. Both of these factors should help put pressure on vehicle manufacturers to meet the RDE standards. In the longer term, there is also the move to electric vehicles which will gather pace.

Emissions in the EFT

As noted in Section 3, the EFT contains estimates of vehicle emissions by Euro Class. The database was updated in November 2017 from v7.0 to v8.0. It now uses NO_x emissions factors for the vehicles taken from the European Environment Agency's COPERT 5 database, compared to the previous COPERT 4 version v11. In the November 2015 submissions to the European Union for compliance against EU Limit Values, Defra used COPERT 4 v11 factors without taking account of the real world performance of the vehicle fleet to data.

The EFT now takes account of the real world performance of Euro 6ab diesel cars, applying a high conformity factor to these vehicles. For Euro 6c vehicles, it assumes that the RDE will be effective in bringing down vehicle emissions. The following graph shows the relative decline in vehicle NO_x emissions predicted for a road in outer London with 5% Heavy Duty Vehicle traffic travelling at 36kph. As air quality models are verified against historic data, the emissions decline is shown relative to 2015.

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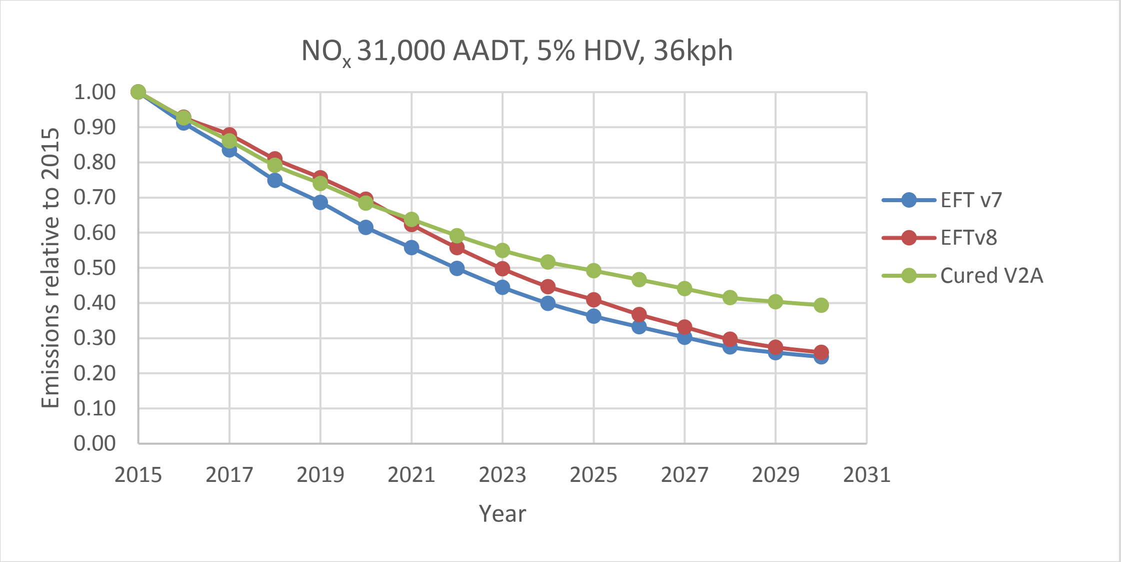
[4] A Portable Emissions Measurement System (PEMS) study of NO_x and primary NO_2 emissions from Euro 6 diesel passenger cars and comparison with COPERT emission factors. Rosalind O'Driscoll. September 2016

[5] http://equaindex.com/equa-air-quality-index/



For emission years prior to 2021, the CURED v2A methodology is likely to give similar results to using the EFT v8.0 data. Post 2021, when the introduction of Euro 6c begins to take effect, then CURED v2A and the EFT v8.0 begin to diverge.

Future Year Assessment Methodology

The selection of emission factors for a future year assessment depends partly on the situation regarding the assessment to be undertaken. Where pollutant concentrations are low and are unlikely to exceed threshold levels, then one may take a conservative approach and keep emission factors at current levels. This will produce a conservative result, but as the result will be 'acceptable' in terms of leading to no exceedances of National Air Quality Strategy Objectives, then it is a reasonable approach to adopt as it avoids uncertainty as to whether there will be exceedances in the future.

In contrast, where pollutant concentrations are high, then a different approach to uncertainty is required. In addition, for a formal Environmental Impact Assessment the legal requirement is to assess 'likely significant effects'. This is not 'worst case' significant effects, but 'likely' significant effects and therefore must allow for a degree of uncertainty in the predictions.

As discussed in Section 2, the use of the verification factor in the modelling takes account, amongst other things, of the difference in the real world emissions performance of vehicles in the fleet. For developments up until 2021, the current EFT should be reasonably accurate as to NO_x emissions as the problem with the performance of diesel vehicles has been recognised. As such, one is justified in using the emission factors for the year of the assessment as the uncertainty in the emission factors is taken account of by using the verification factor.

Developments post 2021 will increasingly be influenced by the assumption that the RDE testing of diesel vehicles is effective, which may or may not turn out to be the case. In essence, the result is likely to lie between the green and red curves of the previous graph. This is likely to become less important as the actual levels of emissions is significantly reduced in the future. If a conservative approach is warranted, one could follow the green curve, the effect of which is outlined in the table below.

Traffic Data year	EFT v8 year
2015	2015
2016	2016
2017	2017
2018	2018
2019	2019

Traffic Data year	EFT v8 year
2015	2015
2020	2020
2021	2021
2022	2021
2023	2022
2024	2022
2025	2023
2026	2023
2027	2024
2028	2024
2029	2025
2030	2025
Beyond 2030	2025

In the case of a large development with a completion year a long time into the future, then if only completion year traffic data are available, it is likely to be appropriate to assume that the completed year traffic data occurs at the opening year of the development. As appropriate, the change a change in emission year in accordance with the above table may be considered.