THE PLANNING ACT 2008

M4 (JUNCTIONS 3 TO 12) (SMART MOTORWAY) DEVELOPMENT CONSENT ORDER APPLICATION

TR010019

Issue Specific Hearing - Environment - Air Quality

Appendix C - Note on LTTE6

Deadline VII - 17 February 2016

DRAFT Note on Long Term Trends

Following submission of Highways Englands response to the ExA second round of written questions, (question 4.6.4) (REP5-004), LB Hillingdon raised a question in response regarding future annual mean nitrogen dioxide (NO_2) concentrations at residential properties to the north of the M4 between Harmondsworth Way and junction 4. In particular, reflecting on previously submitted evidence regarding LTT_{E6}, LB Hillingdon made the assertion that they had expected NO_2 concentrations to be slightly higher using LTT_{E6} than reported in the Environmental Statement.

The purpose of this note is to set out the understanding of the underlying approach of LTT_{E6} as used in the air quality assessment for the M4 Scheme and to help address their concerns set out above.

At the time of producing the guidance Highways England (Highways Agency as was) recognised a gap between measured trends in NO_2 and projections using Defra's EFT and associated air quality tools. Consequently Highways England developed a set of NO_2 projection factors to inform scheme air quality assessments and these projections are referred to as LTT_{E6}. These were based on its considered opinion on the likely rate of improvements in nitrogen dioxide (NO_2) concentrations from 2008, based on the available evidence in measured trends and uncertainty in future Euro 6/VI performance.

The approach developed by Highways England takes account of the known discrepancies between measured NO_2 trends and pre-Euro 6/VI projections which is based on roadside measurements taken before Euro 6/VI vehicles entered the UK fleet i.e. pre-2015 data.

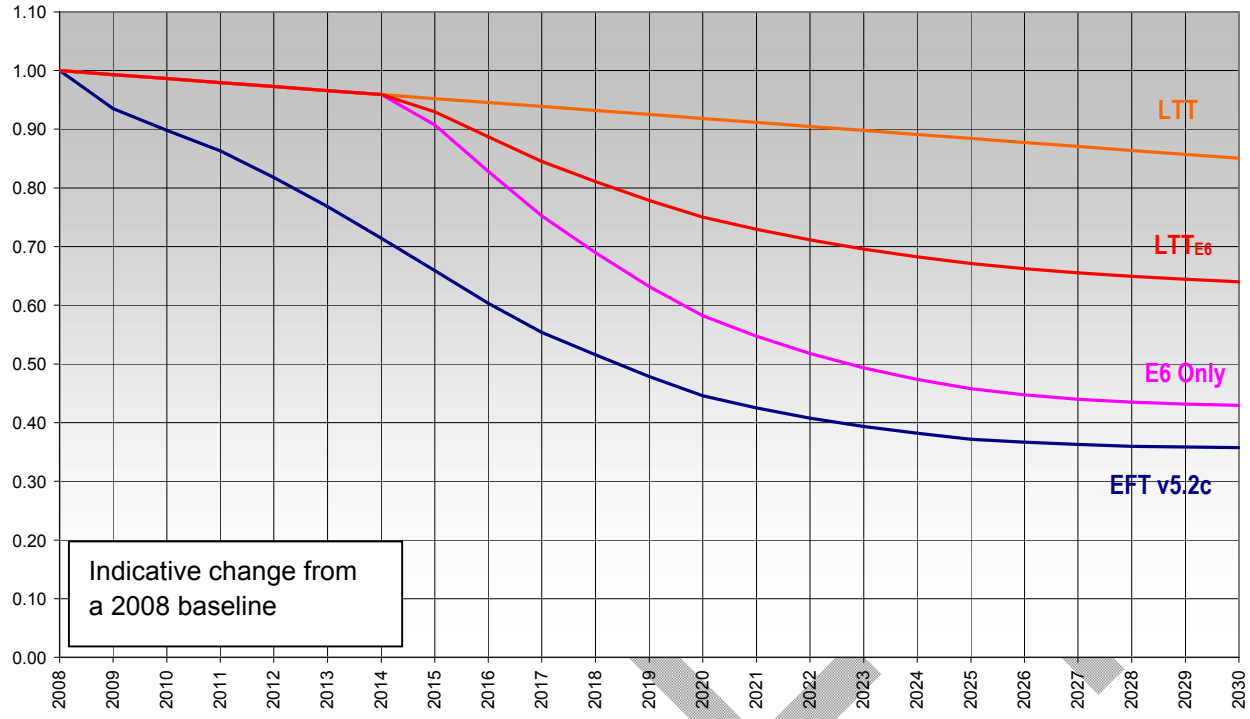
To understand the improvements associated with Euro 6/VI vehicles, the E6 Only curve was developed. The improvements in the E6 Only curve are derived solely from the Euro 6/VI vehicle component of EFT which increases proportionally year on year. Prior to the introduction of Euro 6/VI vehicles into the fleet, the non Euro 6/VI vehicle emissions were derived from the 2008 EFT emission values.

To account for the uncertainty in the actual performance of Euro 6/VI vehicles, the LTT_{E6} curve was produced. This is the midpoint between predicted Euro 6/VI performance based on EFT i.e. the E6 Only curve, and the assumption that Euro 6/VI vehicles were identical to the pre-Euro 6/VI fleet i.e. no improvements in emissions, based on long term trends (the LTT curve).

The selection of a midpoint between the LTT curve and the E6 Only curve effectively uplifts the emissions from Euro 6/VI vehicles, and helps manage the risk concerning real world performance of Euro 6/VI vehicles.

The graph (Figure 1) shows the curves used to derive the factors for the LTT_{E6} projections; effectively Highways England's version of Box 2.1 in Defra's Technical Guidance 2009 *(Box 2.1: Projecting measured annual mean roadside nitrogen dioxide concentrations to future years)*.

Figure 1: Rates of NO_2 Change Informing IAN 170/12 v3



The graph (Figure 1) shows the relative improvements in NO_2 concentrations developed for the LTT_{E6} calculations. It also includes the equivalent results developed from the EFT. These are developed from 2008 base line, the earliest year for which emission factors were available in EFT. The use of this Figure is illustrative to demonstrate the relative differences in rates of improvement over time and shouldn't be used to determine an absolute change between the curves in any given year.

It is important to note that as scheme assessments are undertaken with base years (e.g. 2013) that are more recent than 2008, the graph (Figure 1) above should not be used to assume that the modelled concentrations will be exactly in the mid-point of the E6 Only line and the LTT trend. The trend lines in Figure 1 above were **only** used to derive the annual projection factors that inform LTT_{E6}.

In terms of the M4 scheme assessment, the base year is 2013, and the air quality assessment used traffic data and modelling results which were verified against monitoring data, which effectively resets the EFT curve to the LTT_{E6} value for 2013.

The rate of change between using Defra's tools (i.e. what has been modelled in the Base Year and Projected Base Year (See IAN 170/12v3 for additional information)) and LTT_{E6} will be different depending on when the projections start and end. The LTT_{E6} tool uplifts the modelled concentrations by the application of a gap factor to ensure that the final modelled concentrations are in line with the precautionary rate of change Highways England's considers is appropriate when undertaking scheme assessments (LTT_{E6}, presented in Figure 1).

To illustrate this Table 1 to 3 shows what the differences in the factors that would be derived using different base years but for the same opening year of 2022. The gap factors applied will differ and get smaller as base years become more recent and the LTT_{E6} trend and EFT trend become flatter. This is because Euro 6/VI emissions for all vehicle types are smaller than previous Euro standards and their greater proportion in the UK fleet means that there are less emissions per vehicle than seen historically.

Table 1 – Adjustment factors between various scenarios (2008 baseline)

Trend Line	2008 Rate of Change Factor	2022 Rate of Change Factor	Adjustment factor to be applied to project 2008 to 2022
EFT	1.0	0.41	0.41
LTT_{E6}	1.0	0.71	0.71
Difference between factors			0.3

Table 2 – Adjustment factors between various scenarios (2013 baseline)

Trend Line	2013 Rate of Change Factor	2022 Rate of Change Factor	Adjustment factor to be applied to project 2013 to 2022
EFT	0.77	0.41	0.53
LTT_{E6}	0.97	0.71	0.73
Difference between factors			0.2

Table 3 – Adjustment factors between various scenarios (2015 baseline)

Trend Line	2015 Rate of Change Factor	2022 Rate of Change Factor	Adjustment factor to be applied to project 2015 to 2022
EFT	0.66	0.41	0.62
LTT_{E6}	0.92	0.71	0.77
Difference between factors			0.15

As shown in Table 1 to 3 as the base year moves from 2008 to 2015, so the difference in the gap factors decrease. For example, in Table 3 above for the EFT approach, the 2015 rate of change factor (0.66) is multiplied by the 2022 rate of change factor (0.41) to give an adjustment factor for the predicted concentrations at that receptor of 0.62. By comparison, for the LTT_{E6} approach, the 2015 rate of change factor (0.92) multiplied by the 2022 rate of change factor (0.71) gives the higher adjustment factor of 0.77 to be applied at that receptor. This would result in a higher concentration predicted at that receptor with the LTT_{E6} methodology compared to the EFT.

This also demonstrates why Figure 1 should only be used as the background to how the LTT_{E6} factors have been derived and explains why, in later years of assessment, the variance between EFT predictions and LTT_{E6} predictions reduces.

It should be noted that the LTT_{E6} trend is also based on high traffic flows (such as those encountered on motorways) that would result in relatively high NO_x concentrations. The actual trend that will occur in a scheme assessment will vary depending on where the receptor has been modelled (e.g. if the background component is dominant and has little road component), receptor concentrations are therefore not uplifted by the same factor across the study area.

However, as Highways England are most concerned with receptors with higher concentrations and particularly with exceedances of AQS Objectives in its determination of scheme significance, it is considered that this precautionary approach developed for LTT_{E6} best represents the areas of concern. The curve has been developed based on locations which are likely to contribute to the overall judgement of significance, i.e. locations with higher concentrations/road components. LTT_{E6} is a more precautionary than an assessment approach based solely on EFT with no adjustment for the uncertainty in real world Euro 6/VI vehicle emission performance.