INTERIM ADVICE NOTE 170/12 Revision 1

Updated air quality advice on the assessment of future NOx and NO_2 projections for users of DMRB Volume 11, Section 3, Part 1 'Air Quality

Summary

This IAN provides supplementary advice to users of DMRB Volume 11, SECTION 3, PART 1 (HA207/07). Advice is provided on the use of alternative future NOx and NO_2 projections set out by the Department for Environment, Food and Rural Affairs (Defra) in April 2012.

This IAN is to be used in combination with the published technical air quality guidance issued by Defra.

Instructions for Use

This guidance is supplementary to existing guidance given in DMRB Volume 11, Section 3, Part 1 (HA207/07)

Jun 2013 – Amendments to IAN 170/12

Section	Comment
3.6, paragraph 2	Update to paragraph to improve clarity on presentation of the air quality results and supporting discussion

1. Introduction

This IAN provides updated air quality advice for users of DMRB Volume 11, Section 3, Part 1 'Air Quality' (HA207/07) and enables HA scheme assessments to take into account the impact of future alternative nitrogen dioxide (NO_2) projections.

1.1 Relationship

This IAN provides updated air quality advice for users of DMRB Volume 11, Section 3, Part 1 'Air Quality' (HA207/07).

A spreadsheet to support the implementation of this IAN is provided via the following weblink (Ref 1).

1.2 Implementation

This advice relates to the report on Long Term NOx and NO_2 Trends issued by Defra in July 2011 and the release of Defra's note in April 2012.

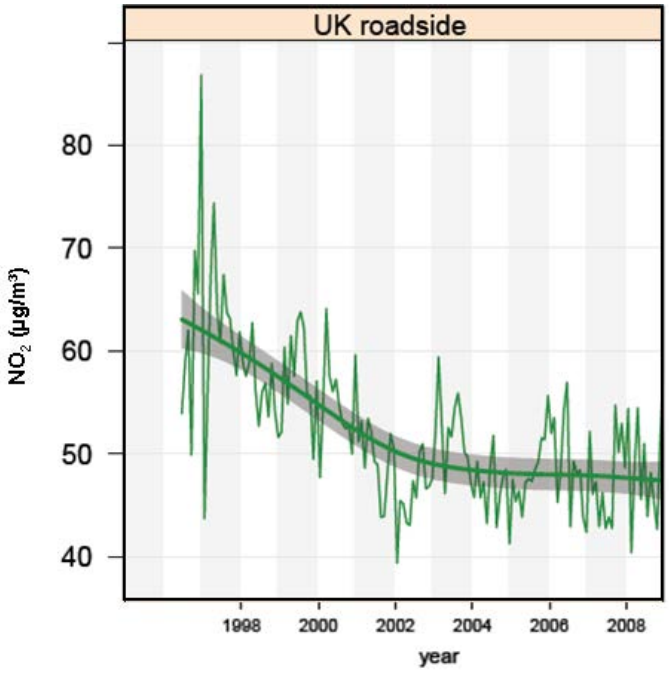
This guidance should be used forthwith on relevant projects in England, where air quality assessments are undertaken and where such projects have yet to submitted for statutory process, including Determination of the need for a statutory Environmental Impact Assessment.

2. Long Term Nitrogen Dioxide Trends

2.1. Introduction

In July 2011 Defra published a report[1] examining the long term air quality trends in NO_x and NO_2 concentrations. Figure 1 is an extract from Defra's report illustrating the long term NO_2 trends observed at roadside monitoring sites.

Figure 1 Long Term Roadside NO_2 Profile



As illustrated in Figure 1 there has been a clear decrease in NO_2 concentrations between 1996 and 2002. Thereafter NO_2 concentrations have stabilised with little to no reduction between 2004 and 2010. Defra's report presents a similar pattern for the change in NO_x concentrations over the same time period.

The consequence of the conclusions of Defra's advice on long term trends is that there is now a gap between current projected vehicle emission reductions and projections on the annual rate of improvements in ambient air quality as previously published in Defra's technical guidance and observed trends.

2.2. HA Review of Long Term Monitoring Data Trends

The HA has undertaken analysis of long term monitored NO_2 concentrations based on combination of automatic and diffusion tube monitoring data collected between 2006 and 2010. The purpose of the analysis was to investigate whether the trends published in Defra's report were seen at monitoring sites in close proximity to HA schemes.

The outcome of the analysis by the HA indicates that the observed trends from the monitoring data closely aligns with the long term trends set out in Defra's July 2011 report.

[1] Trends in NOx and NO2 emissions and ambient measurements in the UK (2011)

3. Approach to be Adopted for Scheme Assessments

The air quality modelling should continue to be completed in accordance with the assessment methodology set out in HA207/07 and with reference to Defra's LAQM.TG(09) guidance where applicable.

The following steps (covered in Sections 3.1 to 3.3) should be undertaken to adjust the verified modelled NO_2 concentrations to account for the long term NO_2 profiles. The HA has developed a spreadsheet to be used in this process to help support scheme assessments (Ref 1).

An additional scenario (hereafter referred to as Projected Base Year) is required to enable the Gap Analysis to be completed. The Projected Base Year scenario uses the base year traffic data and should be modelled using the opening year vehicle emission factors and opening year background concentrations. Table 1 provides the traffic data, vehicle emissions and background concentrations required for an example using base year (2009), projected base year and opening year (2015). Total NO_2 concentrations for this scenario should be calculated as per the base year and opening year models and the appropriate model verification factors calculated for the base year should be applied to the projected base year results.

Table 1 An Example of the Data Requirements for the Various Assessment Scenarios

Scenario	Traffic Data	Vehicle Emissions	Background Concentrations
Base Year	2009	2009	2009
Projected Base Year	2009	2015	2015
Do-Minimum	2015	2015	2015
Do-Something	2015	2015	2015

3.1. Gap Analysis

To correct the **verified** modelled total NO_2 concentrations the results need to be adjusted to represent the observed long term trend profile. This is to be achieved by using Gap Analysis as described in Section 2.4 of Defra's note (April 2012), which allows for the adjustment of one set of data based on a corresponding data set.

To enable the Gap Analysis to be completed annual projection factors are required, which are based on Defra's long term trends report. Table A2 in Appendix 1 of this IAN presents the long term annual projection NO_x and NO_2 factors to be applied to roadside sites. As set out in DMRB, only receptors within 200m of a road will be assessed. Therefore only the roadside adjustment factors will need to be applied to modelled NO_2 concentrations.

The annual projection factors are provided by the HA between 2008 and 2030. The long term trend is assumed to be linear as there is no observed long term impact of emissions from Euro VI vehicles on air quality monitoring trends available at this time. As such the precautionary principal is applied to future projections. Beyond 2017 the projections are expected to be conservative, but as more information becomes available the long term trend projections will be reviewed and this IAN updated accordingly.

3.2. Gap Analysis Methodology

Individual Gap Factors are required for each modelled receptor. Steps 1 to 4 outline the Gap Factor calculation to be followed. An example is provided in Annex 1, Table A1 to help illustrate the various steps.

1. Collate the modelled total NO_2 concentrations for the Base Year, Projected Base Year, Do-Minimum and Do-Something in the Opening Year.

2. Divide the modelled Projected Base Year NO_2 concentration by the modelled Base Year NO_2 concentration (Ratio A)

3. Using the Defra's long term annual projection factors for annual mean NO_2 concentrations set out in Table A2 calculate the annual adjustment factor between the base year and opening year i.e. opening year / base year (Ratio B)

4. Calculate the Gap Factor by dividing Ratio B by Ratio A.

3.3. Applying the Gap Factor to the Modelled Results

The Gap Factor for each receptor can then be applied to the modelled opening year Do Minimum and Do Something NO_2 concentrations to uplift the original **verified** opening year modelled concentrations to better align with long term NO_2 trends.

Where the completion of the Gap Analysis indicates exceedances of the NO_2 air quality thresholds[2] that were not previously modelled using the advice set out in the DMRB air quality chapter, (based on Defra's local air quality management technical guidance), then the assessment should be expanded to include all receptors that represent a reasonable risk of exceeding the air quality thresholds. This will enable a consistent view of the impacts of the scheme to be made in order to inform the significance of the scheme air quality effects.

The results should be tabulated to include the outcomes of the assessments based on Defra's technical guidance and long term NO_2 projections for each of the receptors assessed.

3.4. Assessment of Designated Sites

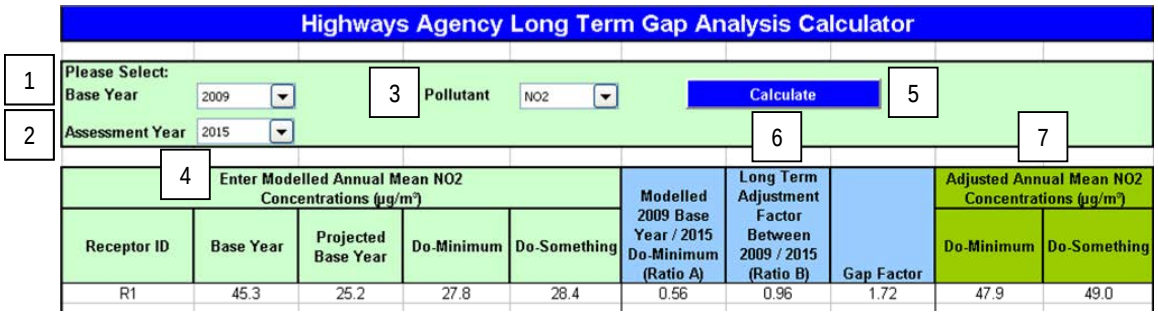
Where NOx concentrations are required for the assessment of designated sites: complete the steps set out in the Gap Analysis Methodology, but use Defra's long term annual projections for Roadside NOx from Table A2.

3.5. Using the HA's Long Term Gap Factor Spreadsheet

The HA have developed a spreadsheet to assist with the Gap Analysis methodology. (Ref 1). The modelled base year, projected base year, and opening year Do-Minimum and Do-Something results should be entered into the spreadsheet. The spreadsheet has been developed to allow up to 65,000 receptors and corresponding modelled results to be entered.

[2] Air quality thresholds includes the annual mean and 1 hour mean NO_2 concentrations defined by the Air Quality Strategy objectives and EU Limit Values

A screenshot of the spreadsheet is presented below, with an overview of the key steps;



Highways Agency Long Term Gap Analysis Calculator

1 Please Select:
Base Year 2009
2 Assessment Year 2015
3 Pollutant NO2
Calculate 5
6
7
4 Enter Modelled Annual Mean NO2 Concentrations (µg/m³)

Receptor ID	Base Year	Projected Base Year	Do-Minimum	Do-Something	Modelled 2009 Base Year / 2015 Do-Minimum (Ratio A)	Long Term Adjustment Factor Between 2009 / 2015 (Ratio B)	Gap Factor	Adjusted Annual Mean NO2 Concentrations (µg/m³) Do-Minimum	Do-Something
R1	45.3	25.2	27.8	28.4	0.56	0.96	1.72	47.9	49.0

1. Select the **Base Year** between 2008 and 2030.
2. Select the **Assessment Year** between 2008 and 2030.
3. Select the **Pollutant** either NO_2 or NOx.
4. Paste or enter the Receptor, Base Year, Projected Base Year, Do-Minimum and Do-Something NO_2 concentrations.
5. Click the **Calculate button** to calculated the Gap Factors for adjusted Do-Minimum and Do-Something concentrations for each receptor.
6. The annual adjustment and Gap Factors are automatically calculated and presented in the spreadsheet.
7. Adjusted annual mean Do-Minimum and Do-Something NO_2 results are automatically calculated from the Gap Factors and presented in the spreadsheet.

3.6. Reporting the Results of the Air Quality Assessment, Including the Long-Term Trends in NO_2

The adjusted long term NO_2 results should be reported in the Environmental Assessment Report for each receptor, alongside the corresponding result based on Defra's technical guidance. The results from both assessments should be compared to the Air Quality thresholds.

A judgement should be made as to which set of results (Defra's technical guidance or long term trends) should be relied upon to form a concluding view of significance. This set of results should then be used in a discussion of the impacts of the scheme and to determine the overall significance of the scheme's impacts. The rationale behind the choice of results on which to base the judgement of significance should also be included in the Environmental Assessment Report.

4. Monitoring Data

The extensive data set reviewed by the HA indicates a close alignment with long term trends from Defra's July 2011 report and provides confidence that this trend is UK wide. However, where individual schemes consider additional monitoring data is required as long term trends in the vicinity of their scheme may differ from the national picture, then they should write to the Overseeing Organisation setting out their reasoning and seeking agreement to undertake this work.

5. Withdrawal Conditions

This IAN will be withdrawn when an updated Volume 11, Section 3, Part 1 Air Quality has been published and / or if Defra's advice is changed.

6. Contacts

Any queries regarding this IAN should be addressed to either:

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7. References

Ref 1 Spreadsheet to support the implementation of this IAN [http://www.dft.gov.uk/ha/standards/ians/pdfs/IAN17012LTcalculator.7z]

Design Manual for Roads and Bridges, Volume 11, Section 3, Part 1, Air Quality (HA207/07) May 2007

8. Additional Reading

Department for Environment, Food and Rural Affairs, Local Air Quality Management, Technical Guidance (LAQM.TG09), February 2009 [as updated by Defra]
http://laqm.defra.gov.uk/review-and-assessment/tools/modelling.html#ProjectingNO2Note

Bureau Veritas on behalf of Department for Environment, Food and Rural Affairs, Note on Projecting NO_2 Concentrations, 30th April 2012.

Department for Environment, Food and Rural Affairs (2011) Trends in NOx and NO2 emissions and ambient measurements in the UK
http://randd.defra.gov.uk/Document.aspx?Document=110718_AQ0724_Final_report.pdf

Annex 1

Table A1. Long Term Annual Projection Factors for Annual Mean NO_2 and NO_x Concentrations Between 2008 and 2030 for Roadside

Receptor	1 **2009 Base Year**	2 **Projected Base Year 2015**	3 **Do Minimum (DM) 2015**	4 **Do Something (DS) 2015**	5 **Ratio A LAQM.TG(09) Projected Base Year (Col 2) / Modelled 2009 Base (Col 1)**	6 **Ratio B Alternative Projection Between 2009 and 2015 (Table A1)**	7 **Gap Factor Ratio B (column 6) / Ratio A (column 5)**	8 **2015 DM DM Result x Gap Factor (Col 3 x Col 7)**	9 **2015 DS DS Result x Gap Factor (Col 4 x Col 7)**
R1	**45.3**	26.8	27.8	27.9	0.59	0.952 / 0.993 =0.959 2015 Factor / 2009 Factor	1.62	**45.1**	**45.2**
R2	39.0	21.9	22.8	23.9	0.56		1.71	38.9	**40.8**
R3	32.2	20.5	21.2	21.8	0.64		1.51	31.9	32.8
R4	29.6	19.5	20.3	20.9	0.66		1.46	29.5	30.4
R5	**49.8**	27.0	29.2	29.7	0.54		1.77	**51.6**	**52.5**
R6	**56.1**	33.7	34.2	34.8	0.60		1.60	**54.6**	**55.6**
R7	32.9	21.1	22.2	23.2	0.64		1.50	33.2	34.7
R8	**41.2**	27.4	29.2	30.1	0.67		1.44	**42.1**	**43.4**
R9	**50.4**	31.1	32.4	33.2	0.62		1.55	**50.3**	**51.6**
R10	**44.4**	28.0	28.5	29.6	0.63		1.52	**43.3**	**45.0**
Concentrations in **bold** indicate exceedances of the Annual Average NO_2 Air Quality Strategy Objective (40µg/m³)									

Table A2. Long Term Annual Projection Factors for Annual Mean NO_2 and NO_x Concentrations Between 2008 and 2030 for Roadside

Average % Reduction Per Year	Nitrogen Dioxide (NO_2)	Oxide of Nitrogen (NO_x)
Year	**0.7**	**1.8**
2008	1.000	1.000
2009	0.993	0.982
2010	0.986	0.964
2011	0.980	0.946
2012	0.973	0.928
2013	0.966	0.910
2014	0.959	0.892
2015	0.952	0.874
2016	0.946	0.856
2017	0.939	0.838
2018	0.932	0.820
2019	0.925	0.802
2020	0.918	0.784
2021	0.912	0.766
2022	0.905	0.748
2023	0.898	0.730
2024	0.891	0.712
2025	0.884	0.694
2026	0.878	0.676
2027	0.871	0.658
2028	0.864	0.640
2029	0.857	0.622
2030	0.850	0.604