

Appendix 6: Calculation Error in Published ES Nitrogen Deposition Results at Tully Bog





Corrected ES Results

In Appendix 8H (*Table 8H.14*) of the published environmental statement (ES), the results presented for nitrogen (N) deposition at Tully Bog SAC (*see Table A6-1*) incorporated an error by way of a missed calculation step in the processing of model results. This resulted in the over-prediction of N-deposition impacts associated with the proposed A5WTC. The text below explains the error and the amendment that has been applied to revise the ES results (*see Table A6-2*).

Distance from nearest affected road (m)	Total N-Deposition Rate (kg N ha ⁻¹ yr ⁻¹)												
	2013 BY	Phase Two (2023)			Phase Three (2028)								
		2023 DM	2023 DS	DS-DM	2028 DM	2028 DS	DS-DM						
ES Reported Results													
0.6m	30.14	22.47	21.50	0.03	20.20	20.40	0.20						
10m	28.24	21.73	21.94	0.21	19.72	19.92	0.20						
20m	27.71	21.55	21.77	0.22	19.58	19.78	0.20						
30m	27.46	21.48	21.70	0.22	19.52	19.72	0.20						
40m	27.32	21.43	21.65	0.22	19.48	19.68	0.20						
50m	27.22	21.40	21.61	0.21	19.46	19.65	0.19						
60m	27.15	21.38	21.59	0.21	19.44	19.63	0.19						
70m	27.10	21.36	21.57	0.21	19.43	19.61	0.18						
80m	27.05	21.35	21.55	0.20	19.42	19.59	0.17						
90m	27.02	21.34	21.53	0.19	19.41	19.58	0.17						
100m	26.99	21.33	21.52	0.19	19.40	19.57	0.17						
110m	26.96	21.32	21.51	0.19	19.40	19.56	0.16						
120m	26.94	21.31	21.50	0.19	19.39	19.55	0.16						
130m	26.92	21.30	21.49	0.19	19.39	19.54	0.15						
140m	26.90	21.30	21.48	0.18	19.38	19.53	0.15						
150m	26.88	21.29	21.47	0.18	19.38	19.53	0.15						
160m	26.87	21.29	21.46	0.17	19.37	19.52	0.15						
170m	26.85	21.28	21.45	0.17	19.37	19.51	0.14						
180m	26.84	21.28	21.45	0.17	19.37	19.51	0.14						
190m	26.83	21.28	21.44	0.16	19.36	19.50	0.14						
200m	26.82	21.27	21.43	0.16	19.36	19.50	0.14						

 Table A6-1
 Annual Mean Nitrogen Deposition Rates at Tully Bog SAC – Published ES Results

* Values reported to 2 d.p.



Distance from nearest affected road (m)	Total N-Deposition Rate (kg N ha ⁻¹ yr ⁻¹)											
	2013 BY	Phase Two (2023)			Phase Three (2028)							
		2023 DM	2023 DS	DS-DM	2028 DM	2028 DS	DS-DM					
Amended ES Results												
0.6m	23.31	18.86	18.87	0.00	17.03	17.05	0.02					
10m	23.12	18.79	18.81	0.02	16.98	17.00	0.02					
20m	23.07	18.77	18.79	0.02	16.96	16.98	0.02					
30m	23.04	18.77	18.79	0.02	16.96	16.98	0.02					
40m	23.03	18.76	18.78	0.02	16.95	16.97	0.02					
50m	23.02	18.76	18.78	0.02	16.95	16.97	0.02					
60m	23.01	18.76	18.78	0.02	16.95	16.97	0.02					
70m	23.01	18.75	18.77	0.02	16.95	16.97	0.02					
80m	23.00	18.75	18.77	0.02	16.95	16.96	0.02					
90m	23.00	18.75	18.77	0.02	16.95	16.96	0.02					
100m	22.99	18.75	18.77	0.02	16.95	16.96	0.02					
110m	22.99	18.75	18.77	0.02	16.95	16.96	0.02					
120m	22.99	18.75	18.77	0.02	16.94	16.96	0.02					
130m	22.99	18.75	18.77	0.02	16.94	16.96	0.02					
140m	22.99	18.75	18.77	0.02	16.94	16.96	0.02					
150m	22.98	18.75	18.76	0.02	16.94	16.96	0.02					
160m	22.98	18.75	18.76	0.02	16.94	16.96	0.02					
170m	22.98	18.75	18.76	0.02	16.94	16.96	0.01					
180m	22.98	18.75	18.76	0.02	16.94	16.96	0.01					
190m	22.98	18.75	18.76	0.02	16.94	16.96	0.01					
200m	22.98	18.74	18.76	0.02	16.94	16.96	0.01					

 Table A6-2
 Annual Mean Nitrogen Deposition Rates at Tully Bog SAC – Amended ES Results

* Values reported to 2 d.p.

Converting NO₂ concentrations to Dry Nitrogen Deposition rates

The assessment of N-deposition at Tully Bog was completed with reference to the calculation steps stated in DMRB HA207/07, *Annex F* – *Assessment of Designated Sites*. Step 5 of the calculation process within Annex F states that:

"...Dry NO₂ deposition rates should be estimated using the following scaling factor which is based on a deposition velocity for NO₂ of 0.001 m/s (taken from EMEP Eulerian photochemistry model). **1** μ g/m³ of NO₂ = 0.1kg N ha⁻¹ yr¹."

Background NO₂ concentration values were derived in accordance with the Annex F calculation steps and the above **0.1 scaling factor** <u>was applied</u> to calculate the **background N-deposition** (i.e. before the contributions from the existing A5 (Do Minimum) and proposed A5WTC (Do Something) were added).

The atmospheric dispersion model (ADMS-Roads) was used to predict the NO_x concentrations at the Tully Bog receptor transect, based on emissions from the assessed roads only, included



in both the Do Minimum and Do Something model scenarios. The NO_x contributions from road sources were converted to NO₂ concentrations with reference to HA207/07 and Defra guidance, as reported in the ES. However, the 0.1 scaling factor <u>was not applied</u> to the **NO₂ concentrations to derive N-deposition attributable to the modelled road sources**. Therefore, the reported N-deposition totals in the ES (*as per Table A6-1*) included a road increment N-deposition equating to a scaling factor of $1 \mu g/m^3$ of NO₂ = 1kg N ha⁻¹ yr¹.

This missed calculation step resulted in the predicted impact of the proposed A5WTC being overestimated by a factor of 10, with respect to N-deposition at Tully Bog. This is considered to be an overly worst case representation.

To address this error, the reported ES results for Tully Bog were revised to apply the 0.1 scaling factor to predicted road increment NO₂ concentrations at the transect receptors. Therefore, the revised values for Tully Bog (*as per Table A6-2*) are based on guidance prescribed in HA207/07 Annex F: $1 \mu g/m^3$ of NO₂ = 0.1kg N ha⁻¹ yr¹.

The revised N-deposition values and impact of the proposed A5WTC at Tully Bog and throughout the length of the Proposed Scheme do not materially impact the conclusions made in the published ES with respect to ecological effects.

Dry Deposition

The assessment methodology prescribed by DMRB Vol 11, Section 3, Annex F – Assessment of Designated Sites (HA207/07) was followed.

Dry N-deposition forms the focus of the DMRB assessment methodology. Wet N-deposition is not considered, given that it is dominated by chemical species with longer atmospheric residence times, which therefore are subject to longer range transport and are not considered locally attributable to the local roads. See quotation below from Air Pollution Information System (APIS);

"Dry deposition of nitrogen oxides is greatest within large conurbations and close to major highways...

...Wet deposition of reduced N comprises fine particulate ammonium (NH4+) salts or aerosols of acidic gases. These components have a relatively long atmospheric residence time, 4 to 15 days, and when removed by precipitation contribute to N deposition in remote ecosystems after long-range transport (Asman et al. 1998)."

Source: http://www.apis.ac.uk/overview/pollutants/overview N deposition.htm