Appendices

Appendix 17.1: Detailed Construction Dust Assessment Methodology

Source

17.1.1 The IAQM dust guidance gives examples of the dust emission magnitudes for demolition, earthworks and construction activities and trackout. These example dust emission magnitudes are based on the site area, building volume, number of HDV movements generated by the activities and the materials used. These example magnitudes have been combined with details of the period of construction activities to provide the ranking for the source magnitude that is set out in Table 17.1.1.

Table 17.1.1 Risk Allocation – Source (Dust Emission Magnitude)

Features of the Source of Dust Emissions	Dust Emission Magnitude
Demolition - building over 75,000 m^3, potentially dusty construction material (e.g. concrete), on-site crushing and screening, demolition activities > 12 m above ground level. **Earthworks** – total site area over 110,000 m^2, potentially dusty soil type (e.g. clay), >10 heavy earth moving vehicles active at any one time, formation of bunds > 6 m in height. **Construction** - total building volume over 75,000 m^3, activities include piling, on-site concrete batching, sand blasting. **Trackout** – over 50 HDV outwards movements in any one day, potentially dusty surface material (e.g. High clay content), unpaved road length > 100 m.	Large
Demolition - building between 12,000 to 75,000 m^3, potentially dusty construction material and demolition activities 6 - 12 m above ground level. **Earthworks** – total site area between 18,000 to 110,000 m^2, moderately dusty soil type (e.g. silt), 5 – 10 heavy earth moving vehicles active at any one time, formation of bunds 3 - 6 m in height. **Construction** - total building volume between 12,000 and 75,000 m^3, use of construction materials with high potential for dust release (e.g. concrete), on-site concrete batching. **Trackout** – 20 - 50 HDV outwards movements in any one day, moderately dusty surface material (e.g. High clay content), unpaved road length 50 – 100 m.	Medium
Demolition - building less than 12,000 m^3, construction material with low potential for dust release (e.g. metal cladding or timber), demolition activities < 6 m above ground, demolition during winter months. **Earthworks** – total site area less than 18,000 m^2. Soil type with large grain size (e.g. sand), < 5 heavy earth moving vehicles active at any one time, formation of bunds < 3 m in height. **Construction** - total building volume below 12,000 m^3, use of construction materials with low potential for dust release (e.g. metal cladding or timber). **Trackout** – < 20 HDV outwards movements in any one day, surface material with low potential for dust release, unpaved road length < 50 m.	Small

Pathway and Receptor - Sensitivity of the Area

17.1.2 Pathway means the route by which dust and particulate matter may be carried from the source to a receptor. The main factor affecting the pathway effectiveness is the distance from the receptor to the source. The orientation of the receptors to the source compared to the prevailing wind direction is a relevant risk factor for long-duration construction projects; however, short-term construction projects may be limited to a few months when the most frequent wind direction might be quite different, so adverse effects can potentially occur in any direction from the site.

17.1.3 As set out in the IAQM dust guidance, a number of attempts have been made to categorise receptors into high, medium and low sensitivity categories; however there is no unified sensitivity classification scheme that covers the quite different potential effects on property, human health and ecological receptors.

17.1.4 Table 17.1.2 and Table 17.1.3 sets out the IAQM basis for categorising the sensitivity of people and property to dust and PM_{10} respectively.

Table 17.1.2 Sensitivities of People and Property Receptors to Dust

Receptor	Sensitivity
Principles:- • Users can reasonably expect enjoyment of a high level of amenity; or • the appearance, aesthetics or value of their property would be diminished by soiling; and • the people or property would reasonably be expected to be present continuously, or at least regularly for extended periods as part of the normal pattern of use of the land. Indicative Examples:- • Dwellings. • Museums and other culturally important collections. • Medium and long-term car parks and car showrooms.	High
Principles:- • Users would expect to enjoy a reasonable level of amenity, but would not reasonably expect to enjoy the same level of amenity as in their home; or • the appearance, aesthetics or value of their property could be diminished by soiling; or • the people or property wouldn't reasonably be expected to be present here continuously or regularly for extended periods as part of the normal pattern of use of the land. Indicative Examples:- • Parks. • Places of work.	Medium
Principles:-	Low

Receptor	Sensitivity
• the enjoyment of amenity would not reasonably be expected; or • there is property that would not reasonably be expected to be diminished in appearance, aesthetics or value by soiling; or • there is transient exposure, where the people or property would reasonably be expected to be present only for limited periods of time as part of the normal pattern of use of the land. Indicative Examples:- • Playing fields, farmland (unless commercially-sensitive horticultural). • Footpaths and roads. • Short-term car parks.	

Table 17.1.3 Sensitivities of People and Property Receptors to PM_{10}

Receptor	Sensitivity
Principles:- • Locations where members of the public are exposed over a time period relevant to the air quality objective (in the case of the 24-hour objective for PM_{10}, a relevant location would be one where individuals may be exposed for eight hours or more in a day). Indicative Examples:- ▪ Residential properties. ▪ Schools, hospitals and residential care homes.	High
Principles:- • Locations where the people exposed are workers and exposure is over a time period relevant to the air quality objective (in the case of the 24-hour objective for PM_{10}, a relevant location would be one where individuals may be exposed for eight hours or more in a day). Indicative Examples:- ▪ Office and shop workers (but generally excludes workers occupationally exposed to PM_{10} as protection is covered by Health and Safety at Work legislation).	Medium
Principles:- • Locations where human exposure is transient exposure. Indicative Examples:- • Public footpaths. • Playing fields, parks. • Shopping streets.	Low

17.1.5 The IAQM methodology combines consideration of the pathway and receptor to derive the 'sensitivity of the area'. Table 17.1.4 and Table 17.1.5 show how the sensitivity of the area has been derived for this assessment.

Table 17.1.4 Sensitivity of the Area to Dust Soiling Effects on People and Property

Receptor Sensitivity	Number of Receptors [a]	Distance from the Source (m) [b]			
		<20	<50	<100	<250
High	>100	High	High	Medium	Low
	10-100	High	Medium	Low	Low
	1-10	Medium	Low	Low	Low
Medium	>1	Medium	Low	Low	Low
Low	>1	Low	Low	Low	Low

The sensitivity of the area has been derived for demolition, construction, earthworks and trackout.

a The total number of receptors within the stated distance has been estimated. Only the highest level of area sensitivity from the table has been recorded.

b For trackout, the distances have been measured from the side of the roads used by construction traffic. The impact declines with distance from the site, and it is only necessary to consider trackout impacts up to 50 m from the edge of the road.

Table 17.1.5 Sensitivity of the Area to Human Health Impacts

Receptor Sensitivity	Annual Mean PM_{10} Concentration [a]	Number of Receptors [b, c]	Distance from the Source (m) [d]			
			<20	<50	<100	<250
High	> 18 µg.m^{-3}	>100	High	High	High	Medium
		10-100	High	High	Medium	Low
		1-10	High	Medium	Low	Low
	16 - 18 µg.m^{-3}	>100	High	High	Medium	Low
		10-100	High	Medium	Low	Low
		1-10	High	Medium	Low	Low
	14 - 16 µg.m^{-3}	>100	High	Medium	Low	Low
		10-100	High	Medium	Low	Low
		1-10	Medium	Low	Low	Low
	< 14 µg.m^{-3}	>100	Medium	Low	Low	Low
		10-100	Low	Low	Low	Low
		1-10	Low	Low	Low	Low
Medium	> 18 µg.m^{-3}	>10	High	Medium	Low	Low
		1 – 10	Medium	Low	Low	Low
	16 – 18 µg.m^{-3}	> 10	Medium	Low	Low	Low

Receptor Sensitivity	Annual Mean PM_{10} Concentration [a]	Number of Receptors [b, c]	Distance from the Source (m) [d]			
			<20	<50	<100	<250
		1-10	Low	Low	Low	Low
	14 – 16 µg.m^{-3}	>10	Low	Low	Low	Low
		1 – 10	Low	Low	Low	Low
	< 14 µg.m^{-3}	>10	Low	Low	Low	Low
		1 – 10	Low	Low	Low	Low
Low	-	>1	Low	Low	Low	Low

The sensitivity of the area has been derived for demolition, construction, earthworks and trackout.

a This refers to the background concentration derived from the assessment of baseline conditions later in this report. The concentration categories listed in this column apply to England, Wales and Northern Ireland but not to Scotland.

b The total number of receptors within the stated distance has been estimated. Only the highest level of area sensitivity from the table has been recorded.

c For high sensitivity receptors with high occupancy (such as schools or hospitals), the approximate number of occupants has been used to derive an equivalent number of receptors.

d For trackout, the distances should be measured from the side of the roads used by construction traffic. The impact declines with distance from the site, and it is only necessary to consider trackout impacts up to 50 m from the edge of the road.

17.1.6 The IAQM dust guidance lists the following additional factors that can potentially affect the sensitivity of the area and, where necessary, professional judgement has been used to adjust the sensitivity allocated to a particular area:

- any history of dust generating activities in the area;
- the likelihood of concurrent dust generating activity on nearby sites;
- any pre-existing screening between the source and the receptors;
- any conclusions drawn from analysing local meteorological data which accurately represent the area; and if relevant the season during which the works will take place;
- any conclusions drawn from local topography;
- duration of the potential impact, as a receptor may become more sensitive over time; and
- any known specific receptor sensitivities which are considered go beyond the classifications given in the table above.

17.1.7 The matrices in Table 17.1.6, Table 17.1.7, Table 17.1.8 and Table 17.1.9 have been used to assign the risk for each activity to determine the level of mitigation that should be applied. For

those cases where the risk category is 'negligible', no mitigation measures are required beyond those mandated by legislation.

Table 17.1.6 Risk of Dust Impacts – Demolition

Sensitivity of Area	Dust Emission Magnitude		
	Large	Medium	Small
High	High Risk	Medium Risk	Medium Risk
Medium	High Risk	Medium Risk	Low Risk
Low	Medium Risk	Low Risk	Negligible

Table 17.1.7 Risk of Dust Impacts – Earthworks

Sensitivity of Area	Dust Emission Magnitude		
	Large	Medium	Small
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Medium Risk	Low Risk
Low	Low Risk	Low Risk	Negligible

Table 17.1.8 Risk of Dust Impacts – Construction

Sensitivity of Area	Dust Emission Magnitude		
	Large	Medium	Small
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Medium Risk	Low Risk
Low	Low Risk	Low Risk	Negligible

Table 17.1.9 Risk of Dust Impacts – Trackout

Sensitivity of Area	Dust Emission Magnitude		
	Large	Medium	Small
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Medium Risk	Low Risk
Low	Low Risk	Low Risk	Negligible

Appendix 17.2: Model Verification

17.2.1 The approach to model verification that LAQM.TG22 recommends for local authorities when they carry out their LAQM duties is summarised in the main air quality chapter. For the verification and adjustment of NO_x /NO_2 concentrations, the guidance recommends that the comparison considers a broad spread of automatic and diffusion-tube monitoring. Dumfries and Galloway Council (DGC) monitors roadside NO_2 concentrations passively using diffusion tubes at one location in the vicinity of the Application Site.

17.2.2 The concentrations monitored over recent years are provided in Table 17.2.1.

Table 17.2.1 Measured Annual-mean NO_2 Concentrations ($\mu g.m^{-3}$)

Monitoring Site	Measured Annual-mean NO_2 Concentrations ($\mu g.m^{-3}$)				
	2018	2019	2020	2021	2022
S10	19.5	18.7	15.5	14.9	15.5

17.2.3 Other roadside sites were not included in this study as they were either not located close to the Site, not representative of the study area, or there was insufficient publicly available traffic count data on the roads closest to these monitors. Data from 2022 was used in this study.

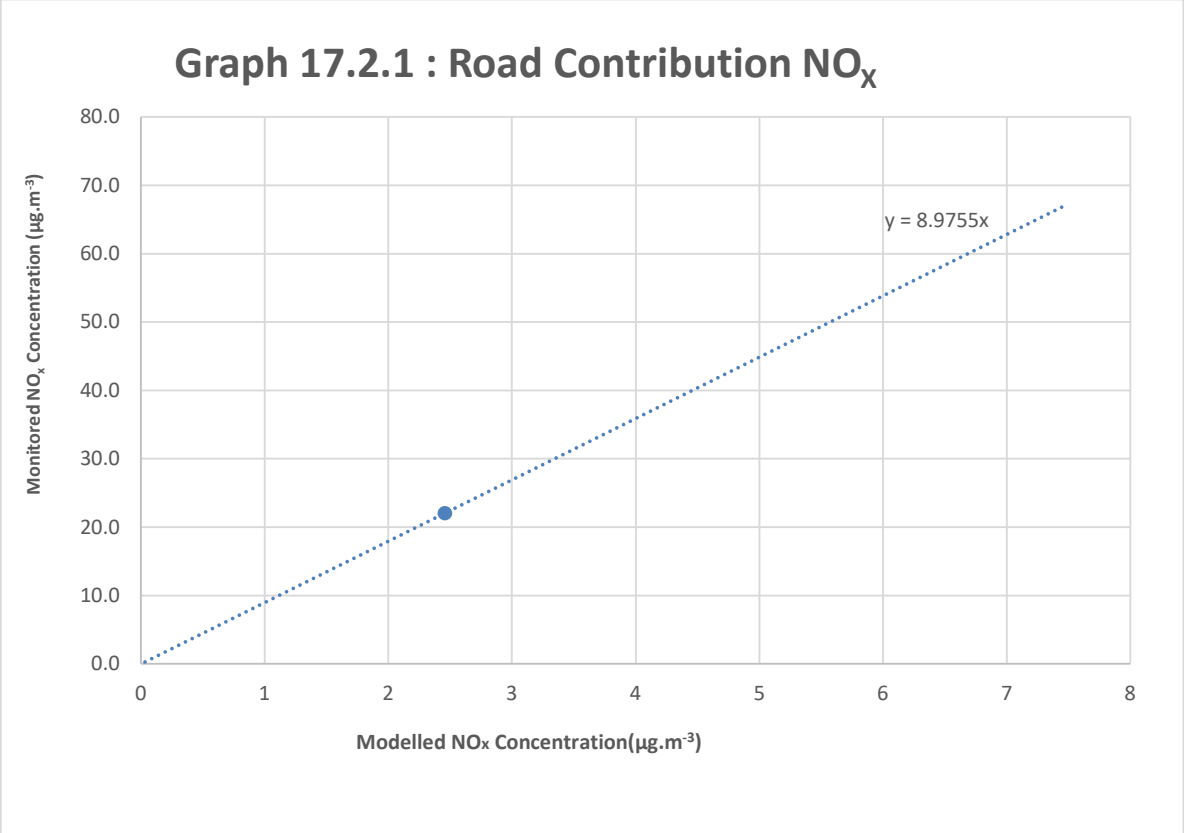
17.2.4 The monitored annual-mean NO_x road contributions have been derived from the monitored annual-mean NO_2 concentrations using the LAQM.TG22 calculator. The monitored annual-mean NO_X road contributions have then been compared with the modelled annual-mean NO_x road contributions. This comparison is provided in Table 17.2.2 below.

Table 17.2.2 Comparison of Monitored and Modelled Annual-mean Road NO_x Contribution ($\mu g.m^{-3}$)

Monitoring Site	Annual-mean Road NO_X Contribution ($\mu g.m^{-3}$)	
	Monitored	Modelled
S10	22.1	2.46

17.2.5 It should be borne in mind that the monitored concentrations are themselves only estimates to the true concentrations at each point; the EU Directive on air quality [i] designates passive NO_2 samplers indicative measures with a potential uncertainty of +/-30 %. Ignoring any uncertainty errors in the monitoring results, the table above indicates that the model is under-predicting at all monitoring sites.

17.2.6 The modelled annual-mean NO_x road contributions have been plotted against the monitored annual-mean NO_x road contributions in Graph 17.2.1.



17.2.7 The modelled NO_x contributions have been multiplied by the gradient of the trend line (8.9755) to determine the corrected NO_x contributions. Modelled annual-mean NO_2 concentrations have been derived from the corrected modelled annual-mean NO_x road contributions.

References

i Council Directive 2008/50/EC of 21 May 2008 on ambient air quality and cleaner air for Europe