

Appendix 6.2: Methodology for the Construction and Operational Phase Assessments

Institute of Air Quality Management Guidance

The methodology for the construction phase dust assessment is set out in guidance from the Institute of Air Quality Management (IAQM)¹.

Step 1

Step 1 is to screen the requirement for a more detailed assessment. The guidance states that an assessment will normally be required where there are existing sensitive human receptors within 350m of the site boundary and/or within 100m of the route(s) used by construction vehicles on the public highway, up to 500m from the site entrance(s).

With regards to ecological receptors, the guidance states that an assessment will normally be required where there are existing receptors within 50m of the site boundary and/or within 50m of the route(s) used by construction vehicles on the public highway, up to 500m from the site entrance(s).

Where any of these criteria are met, it is necessary to proceed to Step 2.

Step 2

Step 2 determines the potential risk of dust arising in sufficient quantities to cause annoyance and/or health or ecological impacts. The risk is related to:

- The activities being undertaken (demolition, number of vehicles and plant etc);
- The duration of these activities;
- The size of the site;
- The meteorological conditions (wind speed, direction and rainfall);
- The proximity of receptors to the activity;
- The adequacy of the mitigation measures applied to reduce or eliminate dust; and
- The sensitivity of receptors to dust.

¹ Institute of Air Quality Management, Guidance on the Assessment of Dust from Demolition and Construction, February 2014

The risk of dust impacts is determined using four risk categories: negligible, low, medium and high risk. A site is allocated to a risk category based upon the following two factors (known as Step 2A and Step 2B).

Step 2A assesses the scale and nature of the works which determines the potential dust emission magnitude as small, medium or large. Examples of how the magnitude may be defined are included in Table B1.

Table 6.1: Determining the Dust Emission Magnitude of Construction Phase Activities			
Activity	Dust Emission Class		
	Large	Medium	Small
Demolition	Total building volume >50,000m ³ ; Potentially dusty construction material (e.g. concrete); On-site crushing and screening; Demolition activities >20m above ground level	Total building volume 20,000-50,000m ³ ; Potentially dusty construction material; Demolition activities 10-20m above ground level	Total building volume <20,000m ³ ; Construction material with low potential for dust release (e.g. metal cladding or timber)
Earthworks	Total site area >10,000m ² ; Potentially dusty soil type (e.g. clay, which will be prone to suspension when dry due to small particle size); >10 heavy earth moving vehicles active at any one time; Formation of bunds >8m in height; Total material moved >100,000 tonnes	Total site area 2,500-10,000m ² ; Moderately dusty soil type (e.g. silt); 5-10 heavy earth moving vehicles active at any one time; Formation of bunds 4-8m in height; Total material moved 20,000-100,000 tonnes	Total site area <2,500m ² ; Soil type with large grain size (e.g. sand); <5 heavy earth moving vehicles active at any one time; Formation of bunds <4m in height; Total material moved <20,000 tonnes; Earthworks during wetter months
Construction	Total building volume >100,000m ³ ; On-site concrete batching; Sandblasting	Total building volume 25,000-100,000m ³ ; Potentially dusty construction material (e.g. concrete); On-site batching	Total building volume <25,000m ³ ; Construction material with a low potential for dust release (e.g. metal cladding or timber)
Trackout	>50 HDV (>3.5t) outward movements ^a in any one day ^b ; Potentially dusty surface material (e.g. high clay content); Unpaved road length >100m	10-50 HDV (>3.5t) outward movements ^a in any one day ^b ; Moderately dusty surface material (e.g. high clay content); Unpaved road length 50-100m	<10 HDV (>3.5t) outward movements ^a in any one day ^b ; Surface material with low potential for dust release; Unpaved road length <50m
<i>a. A vehicle movement is a one way journey i.e. from A to B, and excludes the return journey</i> <i>b. HDV movements during a construction project may vary over its lifetime, and the number of movements is the maximum not the average</i>			

Step 2B considers the sensitivity of the area to dust impacts which is defined as low, medium or high. The sensitivity categories for different types of receptors are described in Table 6.2.

Table 6.2: Sensitivity Categories for Dust Soiling, Human Health and Ecological Effects			
Sensitivity Category	Dust Soiling Effects	Health effects of PM ₁₀	Ecological Effects
High	Users can reasonably expect to enjoy a high level of amenity; Appearance, aesthetics or value of a property would be diminished; Examples include dwellings, museums and other culturally important collections, medium and long term car parks and car show rooms	Locations where members of the public are exposed over a period of time relevant to the air quality objective for PM ₁₀ ; Examples include residential properties, hospitals, schools, and residential care homes	Locations with an international or national designation and the designated features may be affected by dust soiling; Locations where there is a community of a particularly dust sensitive species; Examples include a Special Area of Conservation with dust sensitive features
Medium	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; The appearance, aesthetics or value of their property could be diminished; People or property wouldn't reasonably be expected to be continuously present or regularly for extended periods of time; Examples include parks and places of work	Locations where people are exposed as workers and exposure is over a period of time relevant to the air quality objective for PM ₁₀ ; Examples include office and shop workers but will generally not include workers occupationally exposed to PM ₁₀	Locations where there is a particularly important plant species, where its dust sensitivity is uncertain or unknown; Locations with a national designation where the features may be affected by dust deposition; Examples include a Site of Special Scientific Interest with dust sensitive features
Low	Enjoyment of amenity would not reasonably be expected; Property would not be diminished in appearance, aesthetics or value; People or property would be expected to be present only for limited periods of time; Examples include playing fields, farmland (unless commercially-sensitive horticultural), footpaths, short term car parks and roads	Locations where human exposure is transient; Examples include public footpaths, playing fields, parks and shopping streets	Locations with a local designation where the features may be affected by dust deposition; Examples include a Local Nature Reserve with dust sensitive features

Based on the sensitivity of individual receptors, the overall sensitivity of the area to dust soiling, human health and ecological effects is then determined using the criteria detailed in Tables 6.3 to 6.5, respectively.

Table 6.3: Sensitivity of the Area to Dust Soiling Effects on People and Property ^{ab}					
Receptor Sensitivity	Number of Receptors	Distance from Source (m) ^c			
		<20m	<50m	<100m	<350m
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
a. The sensitivity to the area should be derived for each of the four activities b. Estimate the total number of receptors within the stated distance. Only the highest level of sensitivity from the table needs to be considered c. For trackout, distances should be measured from the side of the roads used by construction traffic. Without site specific mitigation, trackout may occur for up to 500m from large sites, 200m from medium sites and 50m from small sites, measured from the site exit. The impact declines with distance from the site and it is only necessary to consider trackout impacts up to 50m from the edge of the road					

Table 6.4: Sensitivity of the Area to Human Health Impacts ^{ab}							
Receptor Sensitivity	Annual Mean PM ₁₀ Concentration ^c	Number of Receptors ^d	Distance from Source (m) ^e				
			<20m	<50m	<100m	<200m	<350m
High	>32µg/m ³	>100	High	High	High	Medium	Low
		10-100	High	High	Medium	Low	Low
		1-10	High	Medium	Low	Low	Low
	28-32µg/m ³	>100	High	High	Medium	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	High	Medium	Low	Low	Low
	24-28µg/m ³	>100	High	Medium	Low	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	Medium	Low	Low	Low	Low
	<24µg/m ³	>100	Medium	Low	Low	Low	Low
		10-100	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low



Table 6.4: Sensitivity of the Area to Human Health Impacts ^{ab}							
Receptor Sensitivity	Annual Mean PM ₁₀ Concentration ^c	Number of Receptors ^d	Distance from Source (m) ^e				
			<20m	<50m	<100m	<200m	<350m
Medium	>32µg/m ³	>10	High	Medium	Low	Low	Low
		1-10	Medium	Low	Low	Low	Low
	28-32µg/m ³	>10	Medium	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
	24-28µg/m ³	>10	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
	<24µg/m ³	>10	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
Low	-	>1	Low	Low	Low	Low	Low
a. The sensitivity to the area should be derived for each of the four activities b. Estimate the total number of receptors within the stated distance. Only the highest level of sensitivity from the table needs to be considered c. Most straightforwardly taken from the national background maps, but should also take account of local sources. The values are based on 32µg/m³ being the annual mean concentration at which an exceedance of the 24-hour mean objective is likely in England, Wales and Northern Ireland. In Scotland, there is an annual mean objective of 18µg/m³ d. In the case of high sensitivity receptors with high occupancy (such as schools or hospitals) approximate the number of people likely to be present. In the case of residential dwellings, just include the number of properties e. For trackout, distances should be measured from the side of the roads used by construction traffic							

Table 6.5: Sensitivity of the Area to Ecological Impacts ^{ab}		
Receptor Sensitivity	Distance from the Source (m) ^c	
	<20	<50
High	High	Medium
Medium	Medium	Low
Low	Low	Low
a. The sensitivity to the area should be derived for each of the four activities b. Only the highest level of sensitivity from the table needs to be considered c. For trackout, distances should be measured from the side of the roads used by construction traffic		

These two factors are combined in **Step 2C** to determine the risk of dust impacts with no mitigation applied.

The risk of dust effects is determined for four types of construction phase activities, with each activity being considered separately. If a construction phase activity is not taking place on the

site, then it does not need to be assessed. The four types of activities to be considered are:

- Demolition;
- Earthworks;
- Construction; and
- Track-out.

The risk of dust being generated by demolition activities at the site is determined using the criteria in Table 6.6.

Table 6.6: Risk of Dust Impacts for 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

The risk of dust being generated by earthworks and construction at the site is determined using the criteria in Table 6.7.

Table 6.7: Risk of Dust Impacts for Earthworks and 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

The risk of dust being generated by track-out at the site is determined using the criteria in Table 6.8.

Table 6.8: Risk of Dust Impacts for Track-out			
Sensitivity of Area	Dust Emission Magnitude		
	Large	Medium	Small
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Low Risk	Negligible
Low	Low Risk	Low Risk	Negligible

Step 3

Step 3 of the assessment determines the site-specific mitigation required for each of the activities, based on the risk determined in Step 2. Mitigation measures are detailed in guidance published by the Greater London Authority², recommended for use outside the capital by LAQM guidance, and the IAQM guidance document itself. Professional judgement should be used to determine the type and scale of mitigation measures required.

If the risk is classed as negligible, no mitigation measures beyond those required by legislation will be necessary.

Step 4

Step 4 assesses the residual effect, with mitigation measures in place, to determine whether or not these are significant.

Assessment Modelling

Operational Phase Assessment – Road Traffic Emissions

Modelling of Road Traffic Emissions

The air dispersion model ADMS-Roads (CERC, Version 5.1) has been used to assess the potential impact of development generated traffic on air quality at existing receptor locations and the designated habitat sites. In addition, pollutant concentrations have been predicted within the site at locations within the site which are considered to be representative of the proposed residential uses.

The air dispersion model has been used to predict NO₂, PM₁₀ and PM_{2.5} concentrations, as these are the pollutants considered most likely to exceed the air quality objectives for human health. With regards to sensitive vegetation communities and ecosystems, NO₂ is considered to be the major pollutant of concern.

Air dispersion modelling has been carried out to estimate pollutant concentrations, due to road traffic emissions, for three assessment years as follows:

- The Verification and Base Year (2017): This is the most recent year for which meteorological data and local pollution data are available; and
- An Opening/Future Year (2036): This is the year in which the development is anticipated to be fully occupied, and is considered both without the development and with the development in place.

¹¹ Greater London Authority, The Control of Dust and Emissions from Construction and Demolition: Best Practice Guidance, 2006

Road Traffic Data

The ADMS-Roads model requires the input of detailed road traffic flow information for those routes which will be affected by the proposed development. Detailed traffic flow information, for use in the ADMS-Roads air dispersion model, has been provided by Prime Transport Planning, the appointed transport consultant for the project. The traffic flow information is included in Appendix 5.4.

Further details of these are included in Chapter 8 'Traffic and Transport' and Chapter 13 'Residual & Cumulative Effects'.

Meteorological Data

The meteorological data used in the air dispersion modelling has been obtained from ADM Limited. Meteorological data has been obtained for 2017 from the Thorney Island Meteorological Recording Station. This is located approximately 5km from the proposed development site and is considered to be the most representative of the conditions at the proposed development and the designated habitat sites, due to its relative location and similar altitude.

The meteorological data provides hourly wind speed and direction information. The 2017 wind rose for the Thorney Island Meteorological Recording Station is included in Appendix 5.5.

Existing Sensitive Receptor Locations

Twenty representative existing sensitive receptor locations (identified as ESR 1 to ESR 20) have been considered in the air quality assessment. These are residential in nature, and have been selected as they are locations at which the annual mean air quality objectives apply and are the most likely to be impacted by the proposed development.

Details of these are shown on drawing GM11062-001.

Model Validation, Verification and Adjustment

LAQM.TG(16) recognises that model validation generally refers to detailed studies that have been carried out by the model supplier or a regulatory agency. The ADMS-Roads model has been validated by the supplier CERC.

Model verification is used to check the performance of the model at a local level. The verification of the ADMS-Roads air dispersion model is achieved by modelling concentration(s) at existing monitoring location(s) in the vicinity of the proposed development and comparing the modelled concentration(s) with the measured

concentration(s).

HBC operates four roadside NO₂ monitoring locations along the road network for which traffic information is available.

Bias-adjusted 2017 monitoring data was provided by HBC, as this is the most recent full year for which monitoring data is available. The monitoring data that has been used in the model verification procedure is detailed in Table 6.9.

Table 6.9: NO ₂ Monitoring Data for 2017 Used for Verification Purposes				
Monitoring Location Reference	Type	Grid Reference		2017 Bias Adjusted NO ₂ Annual Average Concentration (µg/m ³)
		Easting	Northing	
68 Havant Road	Diffusion Tube	472202	102049	32.91
Langstone Road (West)	Diffusion Tube	471613	105611	35.17
Xyratex	Diffusion Tube	471613	105673	30.95
Bosmere Junior School	Diffusion Tube	471706	105933	28.97
NO ₂ monitoring data provided by HBC				

There are no representative roadside PM_{2.5} or PM₁₀ monitoring locations along the road network for which traffic flow information is available. It has not therefore been possible to undertake verification of PM_{2.5} or PM₁₀ concentrations.

Critical Load Assessment for the Chichester and Langstone Harbours and Solent Maritime Designated Habitat Complex

Guidance on assessing the potential effects of proposed developments on conservation sites is provided via the Centre for Hydrology and Ecology APIS resource³. The Environment Agency's (EA) "AQTAG06" document⁴ provides further useful technical guidance on carrying out an appropriate assessment of emissions to air in fulfilment of the requirements of The Conservation of Habitats and Species Regulations 2010 No. 490 (referred to as the "Habitats Regulations"). Guidance on the assessment of significance is provided by the IAQM⁵.

The methodology applied in the assessment of the Chichester and Langstone Harbours and Solent Maritime Designated Habitat Complex is as follows:

³ APIS (www.apis.ac.uk)

⁴ Environment Agency, "AQTAG06 Technical Guidance on detailed modelling approach for an appropriate assessment for emissions to air," November 2013

⁵ IAQM, A Guide to the Assessment of Air Quality Impacts on Designated Nature Conservation Sites, June 2019



- The extent of the Chichester and Langstone Harbours and Solent Maritime Designated Habitat Complex conservation site, adjacent to affected roads, has been identified using the Multi-Agency Geographic Information for the Countryside resource (MAGIC)⁶;
- A set of points has been identified to cover the extent of the designated habitat complex;
- Deposition rates of NO₂ have been calculated using the EA recommended deposition velocities for woodland;
- Deposition rates of nitrogen per hectare per year (kg N/ha/year) and deposition rates of nitrogen-derived acid per hectare per year (kEq/ha/year) have been calculated from the modelled NO₂ deposition rates;
- Critical levels and loads have been derived using the site-relevant critical load feature within the APIS resource; and
- Modelled concentrations and deposition rates have been assessed against critical levels and loads respectively to determine whether emissions to air from the proposed development can be screened out of comprising significant contributions to the conservation site.

Concentrations of NO₂ have been predicted by modelling atmospheric concentrations of NO_x, using ADMS-Roads, and converting to NO₂ using the NO_x to NO₂ calculator. The modelled annual mean deposition rates include consideration of emissions from modelled road traffic sources only, and therefore exclude background deposition rates.

Furthermore, contributions to pollutant nitrogen at the designated habitat site have been predicted for the proposed development both in-isolation and in-combination with committed development.

Natural England and IAQM guidance indicate that the risk of a potentially significant impact can be screened out if the contribution from a development, both in-isolation and in-combination with other relevant schemes, is less than 1% of the relevant critical level / load, even in circumstances where background deposition is close to, or above, the critical level / load.

Site-relevant critical levels and loads have been obtained from the APIS website for the Blean

⁶ Multi Agency Geographic Information for the Countryside (www.magic.gov.uk)

Complex conservation site. These critical levels and loads are shown in Table 6.10.

Table 6.10: Site Relevant Critical Loads for the Blean Complex				
Designated Feature	Critical Level for NO_x ($\mu\text{g}/\text{m}^3$)	Critical Load for Nitrogen Deposition ($\text{kgN}/\text{ha}/\text{year}$)	Critical Load for Nitrogen-Derived Acid Deposition	
			MinCLminN ($\text{kEq}/\text{ha}/\text{year}$)	MinCLmaxN ($\text{kEq}/\text{ha}/\text{year}$)
Superlateral Sediment (Sterna albifrons - Little Tern)	30	8	0.223	1.308
Lowest habitat-specific critical loads used in order to provide a robust assessment				

The process contribution to annual mean NO_x concentration has been assessed as a percentage of the critical level.

The process contribution to both nutrient nitrogen and nitrogen-derived acid deposition has been assessed as a percentage of the appropriate critical load. Acid deposition has been assessed with reference to the guidance outlined within the APIS Critical Load Function Tool for Acidity⁷. The guidance provided with this tool enables a calculation to be made of the contribution to acid deposition as a percentage of the relevant critical load value.

This guidance advises “where PEC is greater than CLminN (the majority of cases), the combined inputs of sulphur and nitrogen need to be considered. In such cases, the total acidity input should be calculated as a proportion of the CLmaxN.

Where $\text{PEC N Deposition} > \text{CLminN}$

$\text{PC as \%CL function} = ((\text{PC of S+N deposition})/\text{CLmaxN}) * 100$

For this study, the PEC (Predicted Environmental Concentration, i.e. the combined PC (Process Contribution) and background level) is greater than CLminN and, consequently, the above calculation has been used to calculate the PC as a percentage of the critical load function.

Model Locations

The model has been set up to predict concentrations of released substances at points covering the extent of the designated habitat complex within 200m of affected roads. All but

⁷ Available on the APIS website (<http://www.apis.ac.uk/critical-load-function-tool>)

two of the modelled points were included within a grid of points, as specified below:

- South-west corner: 471680, 103690;
- North-east corner: 472330, 105290;
- Grid spacing (west to east): approximately 34 points at 20m spacing; and
- Grid spacing (south to north): approximately 81 points at 20m spacing.

Two additional points were included as follows:

- 471727, 102920; and
- 472497, 101285.

Significance Criteria

Human Receptors

Guidance has been prepared by *EPUK* and the *IAQM* with relation to the assessment of the air quality impacts of proposed developments and their significance.

The impact of a development is usually assessed at specific receptors, and takes into account both the long term background concentrations, in relation to the relevant Air Quality Assessment Level (AQAL) at these receptors, and the change with the development in place.

The impact descriptors for individual receptors are detailed in Table 6.11.

Table 6.11: Impact Descriptors for Individual Receptors				
Long Term Average Concentration at Receptor in Assessment Year*	Percentage Change in Concentration Relative to Air Quality Assessment Level (AQAL)*			
	1%	2-5%	6-10%	>10
75% or less of AQAL	Negligible	Negligible	Slight	Moderate
76-94% of AQAL	Negligible	Slight	Moderate	Moderate
95-102% of AQAL	Slight	Moderate	Moderate	Substantial
103-109% of AQAL	Moderate	Moderate	Substantial	Substantial
110% or more of AQAL	Moderate	Substantial	Substantial	Substantial
<i>*Percentage pollutant concentrations have been rounded to whole numbers, to make it easier to assess the impact. Changes of 0% (i.e. less than 0.5%) should be described as negligible</i>				

Determining the Significance of Effects

Impacts on air quality, whether adverse or beneficial, will have an effect on human health that can be judged as either 'significant' or 'not significant'.

Once the impact of the Proposed Development has been assessed for the individual impacts, the overall significance is determined using professional judgement. This takes into account

a number of factors such as:

- The existing and future air quality in the absence of development;
- The extent of the current and future population exposure to the impacts; and
- The influence and validity of any assumptions adopted when undertaking the prediction of impacts.

Ecological Receptors

The Guidance published by Natural England (NE) and the IAQM provides advice on the assessment of road traffic emissions on sensitive designated habitat sites with international and/or European designations, i.e SAC (SCI or SAC), SPA, SPA and Ramsar sites. The screening criteria follow the superseded Design Manual for Roads and Bridges (DMRB) guidance, requiring that sites which are located within 200m of an 'affected' road, need to be considered.

Roads are deemed 'affected' if a proposed development leads to:

- A change in road alignment of 5m or more;
- A change in daily traffic flow of 1,000 AADT or more;
- A change in HGV flow of 200 AADT or more;
- A change in daily average speed of 10 kph or more; and
- A change in peak hour speed of 20kph or more