Institute of Air Quality Management

Guidance on the Assessment of the Impacts of Construction on Air Quality and the Determination of their Significance

JANUARY 2012

Acknowledgements

This Guidance has been produced by a Working Group established following a meeting organised by the Institute of Air Quality Management (IAQM) and the Building Research Establishment (BRE) on "Controlling Particles from Construction Activities" held in January 2011. It is the result of the voluntary contributions of the following people, for which IAQM is very grateful.

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A large number of comments have been received from IAQM members on the draft of this Guidance. Many were very detailed and all were useful contributions that have helped clarify the Guidance.

IAQM is also grateful for the co-operation of the Greater London Authority in developing this Guidance.

This document is available for download from the IAQM website (iaqm.co.uk) together with examples of the use of the Guidance[1]. Please go to IAQM Guidance.
Comments should be sent to constructionguidance@iaqm.co.uk.

[1] Available from January 2012

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1. Introduction

The Institute of Air Quality Management (IAQM) is committed to enhancing the understanding and development of the science behind air quality by promoting knowledge and understanding of best working practices. Membership of IAQM is mainly drawn from practicing air quality professionals working within the fields of air quality science, air quality assessment and air quality management.

There is evidence of major construction sites increasing long term PM_{10} concentrations[2] and the number of days[3] when PM_{10} concentrations exceed 50μg/m^3, as well as giving rise to annoyance due to the soiling of surfaces by dust, although the scale of these impacts depends on the dust suppression and other mitigation measures applied.

Emissions can occur during the preparation of the land (e.g. demolition, land clearing, and earth moving), and during construction, and can vary substantially from day to day, depending on the level of activity, the specific operations being undertaken, and the weather conditions. A large portion of the emissions results from site plant and road vehicles moving over temporary roads and open ground. If mud is allowed to get onto local roads, dust emissions can occur at some distance from the originating site.

Local planning authorities often require the impacts of new developments to be assessed as part of the decision making process, either as a standalone document or as part of a wider Environmental Impact Assessment. The latter requires both the construction and operational phases of developments to be considered, and as a result many stand-alone air quality assessments also consider the effects of both phases of new developments.

This document is designed to provide guidance for developers, their consultants and environmental health officers on how to assess these impacts. As the effects depend to a large extent on the mitigation measures adopted, the emphasis has been on classifying sites according to the risk of effects, to identify the mitigation appropriate to the risk. Mineral sites share many features with construction sites but can be of a significantly larger scale, and therefore different approaches may be appropriate for the assessment of these sites.

This Guidance is aimed primarily for use in the UK, where the vast majority of IAQM members work. However, it is recognised that the membership of IAQM is international and that the Guidance may be applied elsewhere. Where this occurs careful consideration needs to be given to its applicability in different climates and where working practices on construction sites may be significantly different.

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[2] Measurements of air pollution emissions from a construction site : A Case Study, Report for Greater London Authority, Stuart Upton and Vina Kukadia, BRE Environment, Watford 2004

[3] The impact of local fugitive PM_{10} emissions from building works and road works on the assessment of the European Union Limit Value, Gary D Fuller and David Green, Atmos. Env 38 (2004) 4993-5002

As experience of using the Guidance develops, and when the results of further research on the distance over which impacts occur become available, it is anticipated that revisions of this document will become necessary. IAQM do not intend to print this Guidance, instead it will be made available for download from the website (www.iaqm.co.uk*).*

2. Terminology

The construction impact assessments reviewed by IAQM identified the use of a range of different terminology, often with different meanings. This section aims to provide some definitions to help ensure consistency between the construction impact assessments produced by different organisations.

Annoyance	Loss of amenity due to dust deposition or visible dust plumes, often related to people making complaints, but not sufficient to be a legal Nuisance.
Construction	Any activity involved with the provision of a new structure (or structures). A structure will include a residential dwelling, office building, retail outlet, road, etc.
Demolition	Any activity involved with the removal of an existing structure (or structures). This may also be referred to as de-construction, specifically when a building is to be removed a small part at a time.
Deposited Dust	Airborne dust deposited onto a surface. This can give rise to visible soiling of the surface.
Dust	Refers to all airborne particulate matter (i.e. total suspended particles, also known as TSP). Therefore in this Guidance the term 'dust' has been used to include both the particles that give rise to soiling and to human health effects. Note: this is different to the definition given in BS 6069, where dust refers to particles up to 75 μm.
Earthworks	Covers the processes of soil-stripping, ground-levelling, excavation and landscaping.
Effects	The consequences of the changes in airborne concentrations and/or dust deposition for a receptor.
EIA	Environmental Impact Assessment, as required by The Town and Country Planning (Environmental Impact Assessment) (England and Wales) Regulations 2011; The Town and Country Planning (Environmental Impact Assessment (Scotland) Regulations 2011; and The Planning (Environmental Impact Assessment) Regulations (Northern Ireland) as may be amended from time to time having regard to the Environmental Impact Assessment Directive (85/337/EEC) (as amended).
ES	Environmental Statement, the document that reports the work undertaken for the EIA.

Impacts	The changes in airborne concentrations and/or dust deposition, irrespective of whether there are effects on receptors. A scheme can have an 'impact' on airborne dust without having any 'effects', for instance if there are no receptors to experience the impact.
Nuisance	This term has specific meanings in environmental law: (a) Statutory nuisance, as defined in S79(1) of the Environmental Protection Act 1990 (as amended from time to time) (b) Private nuisance, arising from substantial interference with a person's enjoyment and use of his land. (c) Public nuisance, arising from an act or omission that obstructs, damages or inconveniences the rights of the community. Each of these applying in so far as the nuisance relates to the unacceptable effects of emissions. It is recognised that a significant loss of amenity may occur at lower levels of emission than would constitute a statutory nuisance[4]. Note: as Nuisance has a specific meaning in environmental law, and to avoid confusion, it is recommended that the term is not used in a more general sense
PM	Particulate matter, PM_{10} is essentially particulate matter with an aerodynamic diameter less than 10 microns (µm); $PM_{2.5}$ is less than 2.5 µm.
Risk	The likelihood of an adverse event occurring.
Trackout	The transport of dust and dirt from the construction / demolition site onto the public road network, where it may be deposited and then re-suspended by vehicles using the network. This arises when lorries leave the construction / demolition site with dusty materials, which may then spill onto the road, and/or when lorries transfer dust and dirt onto the road having travelled over muddy ground on site.
TSP	Total suspended particulate matter.

[4] See Planning Policy Statement 23 : Planning and Pollution Control, Office of the Deputy Prime Minister, 2004

3. Background

At the end of 2009 IAQM produced its *Position on the Description of Air Quality Impacts and the Assessment of their Significance*. This provides guidance for defining the significance of an air quality impact arising from the operation of a new development, based on the magnitude of change (i.e. the increase or decrease in predicted concentrations as a result of a proposed development) and the sensitivity of the receptors (i.e. the air quality in the area with respect to the air quality objectives). This guidance has been incorporated into *Development Control: Planning for Air Quality (2010 Update),* published by Environmental Protection UK, and is being widely used by air quality professionals across the country.

Environmental Impact Assessment (EIA) requires the consideration of any impacts associated with the demolition / construction phases of a proposed development. Assessment of impacts associated with construction and demolition is also frequently required outside of the formal EIA process. Accordingly, the IAQM identified the need for further guidance.

The Building Research Establishment (BRE) undertook research, in association with the construction industry, to investigate the efficacy of dust mitigation measures, which resulted in BRE guidance being published in 2003.

In 2006 the Greater London Authority (GLA) with the London Councils produced *The Control of Dust and Emissions from Construction and Demolition: Best Practice Guidance*, with the assistance of BRE and others. This guidance is widely referred to in assessments of construction impacts, even in areas outside London, but assessment methodology and significance criteria were outside the scope of this document. The Mayor of London committed to updating this guidance in his 2010 Air Quality Strategy.

The GLA has closely collaborated with the IAQM in the development of both this and other IAQM guidance. Similarly, the IAQM has collaborated with the GLA in the revision of its guidance.

In the development of this Guidance there has been much debate over the evidence for the numbers used to define the risk categories. Given the current knowledge these can only be indicative at the current time.

The evidence on the distance over which impacts may occur is limited. Extensive monitoring of PM_{10} around construction sites has occurred since the GLA Best Practice Guidance was first published. However, there has been little or no attempt to pull this information together. It is often collected on a site by site basis, by developers who have no direct interest in extending the knowledge base by publishing the findings. The IAQM anticipates that this Guidance will be revised as and when more scientific evidence is available, but believes that it provides a good framework for the assessment of dust impacts.

4. Methodology for the Development of this Guidance

The IAQM organised an open meeting, in association with BRE, in January 2011. This generated a great deal of interest amongst IAQM members. As an outcome of that meeting, and working with the GLA, five tasks were identified that needed to be undertaken to prepare both the IAQM guidance and to update the GLA 2006 guidance. These were to:

1. Provide guidance on the assessment of impacts and their significance;
2. Review site evaluation guidelines;
3. Review mitigation measures;
4. Review requirements for non-road mobile machinery (NRMM); and
5. Review monitoring techniques.

This Guidance is the outcome of Tasks 1 and 2. Tasks 3 and 4 are to be undertaken by the GLA and Task 5 by the IAQM. The latter will result in a separate IAQM guidance document.

A review of the methodology for the assessment of construction impacts used by 10 consultancies, presented at the January 2011 meeting, identified a range of approaches. None of the consultancies attempted to quantify the air quality impacts, and all used a qualitative approach.

This IAQM Guidance has been produced using the experience of the Working Group established following the BRE meeting, and has taken into account relevant literature, BRE research and the GLA/London Councils' Best Practice Guidance[5].

Annex 1: Dust of Minerals Policy Statement 2: Controlling and Mitigating the Environmental Effects of Minerals Extraction in England (MPS2), contains much useful information on the nature of dust, its sources, dispersion and fate in the atmosphere. However the scale of mineral works is, in general, significantly greater than the vast majority of demolition / construction sites, and thus the guidance in MPS2 in not necessarily directly applicable. For example, it is considered unlikely that significant PM_{10} impacts occur to a distance of 1 km from any demolition / construction site as cited in MPS 2. Furthermore, many members of the Working Group consider that the evidence of this scale of impact, even from mineral workings, is poor.

The draft Guidance was circulated by email to IAQM members for their comments. Each comment has been carefully considered and taken into account, as appropriate, in the preparation of this final Guidance document.

[5] The Control of Dust and Emissions from Construction and Demolition, Best Practice Guidance, Greater London Authority and London Councils, November 2006.

5. Potential Impacts

5.1 Introduction

The main air quality impacts that may arise during construction activities are:

1. Dust deposition, resulting in the soiling of surfaces
2. Visible dust plumes, which are evidence of dust emissions
3. Elevated PM_{10} concentrations, as a result of dust generating activities on site
4. An increase in concentrations of airborne particles and nitrogen dioxide due to exhaust emissions from diesel powered vehicles and equipment used on site[6].

The most common impacts are dust soiling and increased ambient PM_{10} concentrations due to dust arising from activities on the site. Dust soiling will arise from the deposition of PM in all size fractions, but will be associated mostly with particulate matter greater than 10 μm. The ambient PM relevant to health outcomes will be that measured as PM_{10}, although most of this will be in the $PM_{2.5-10}$ fraction, rather than the $PM_{2.5}$ fraction. Research undertaken in the US[7] suggests that 85% to 90% by weight of the fugitive dust emissions of PM_{10} from construction sites are $PM_{2.5-10}$ and 10% to 15% are in the $PM_{2.5}$ fraction.

There are other potential impacts, such as the release of heavy metals, asbestos fibres or other pollutants during the demolition of certain buildings such as former chemical works, or the removal of contaminated soils. The release of certain fungal spores during the demolition of old buildings can give rise to specific concerns if immune-compromised people are likely to be exposed, for example close to an oncology unit of a hospital. These issues need to be considered on a site by site basis, and are not specifically covered by this Guidance, but are likely to increase the dust risk category of the site (see Section 8 STEP 2: Assess the risk of dust arising from the works). Particularly stringent dust mitigation measures will be required for these sites, which will also need to comply with the Health and Safety at Work etc. Act 1974 and the Construction (Design and Management) Regulations 2007 (as may be amended from time to time). These contamination and health and safety issues are, however, outside the scope of this Guidance and are not considered further.

Experience of assessing the exhaust emissions from on-site plant and site traffic suggests that they are unlikely to make a significant impact on local air quality, and in the vast majority of cases they will not need to be quantitatively assessed. For site traffic on the public highway, if it cannot be scoped out (for example by using the Environmental Protection UK's criteria), then it should be assessed using the same methodology and significance criteria as

[6] In the UK the maximum permitted sulphur content of fuels used in road and off-road applications is 10ppm, and therefore sulphur dioxide is no longer a significant pollutant from these sources.

[7] Background Document for Revisions to Fine Fraction Ratios Used for AP-42 Fugitive Dust Emission Factors Prepared by Midwest Research Institute (Chatten Cowherd, MRI Project Leader), For Western Governors' Association Western Regional Air Partnership (WRAP), MRI Project No. 110397, Finalized November 1, 2006

the operational traffic impacts. For site plant and on-site traffic, consideration needs to be given to the number of plant/vehicles and their operating hours and locations.

A human 'receptor', as considered within this Guidance, will refer to any location where a person may experience the annoyance effects of airborne dust or dust soiling, or exposure to PM_{10} over a time period relevant to the air quality objectives, as defined in the Government's technical guidance for Local Air Quality Management[8]. In terms of annoyance effects, this will most commonly relate to residential dwellings, but may also refer to industrial and commercial premises that have a particular sensitivity to dust impacts. The latter may include, for example, vehicle showrooms, food manufacturers or electronics manufacturers. Care should be taken to ensure that the assessment takes into account whether exposure will arise in practice (e.g. computer chip manufacture is sensitive to dust and so premises are likely to have extensive dust filtering equipment, exposure may therefore not be increased).

An ecological receptor refers to any sensitive habitat affected by dust soiling. This includes the direct impacts on vegetation or aquatic ecosystems of dust deposition, and the indirect impacts on fauna (e.g. on foraging habitats). For locations with a statutory designation, e.g. SACs and SSSIs consideration needs to be given as to whether the particular site is sensitive to dust and will depend on why it has been designated. Some non-statutory sites (i.e. local wildlife sites) and/or locations with very specific sensitivities may also be considered if appropriate. These may include horticultural operations, e.g. salad or soft-fruit production. The inclusion or exclusion of sites should be justified in the assessment.

The risk of dust emissions from a demolition / construction site causing loss of amenity and/or health or ecological effects is related to:

- the activities being undertaken (demolition, number of vehicles and plant etc.);
- the duration of these activity;
- 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 the receptors to dust.

The quantity of dust emitted from construction operations will be related to the area of land being worked and the level of construction activity (nature, magnitude and duration). Emissions from construction vehicles passing over unpaved ground can be particularly important. These will be related to the silt content of the soil (defined by the US Environmental Protection Agency as particles smaller than 75 micrometres [µm] in diameter), as well as the speed and weight of the vehicle, the soil moisture content, the distance covered and the frequency of vehicle movements.

[8] Local Air Quality Management Technical Guidance LAQM.TG(09), Defra, February 2009

The wind direction, wind speed and rainfall, at the time when a construction activity is taking place, will also influence whether there is likely to be a dust impact. Due to the variability of the weather, it is impossible to predict what the weather conditions will be when specific construction activities are being undertaken. Therefore the assessment of construction dust impacts is typically qualitative.

Adverse impacts can occur in any direction from the site; however they are more likely to occur downwind of the prevailing wind and/or close to the site. Dust impacts are more likely to occur during drier periods as rainfall acts as a natural dust suppressant.

Local wind speed and direction data can be used to assess the risk of a significant dust impact. This will depend on the frequency that the receptor is downwind and the distance of the receptors from the construction activities. It is generally the higher wind speeds that will result in the highest potential for release of dust from a site. In urban areas it is important to take account of the effect of buildings on local wind patterns.

Impacts during the summer and winter months are generally different, and if it can be guaranteed that the construction will take place during a particular season (with this enforced through a planning condition, for example), consideration could be given to using seasonal wind and rainfall data. This type of guarantee is not usual, because construction tends to start as soon as possible after the permission is granted.

Local conditions also need to be accounted for. Topography and natural barriers (e.g. woodland) will reduce airborne concentrations due to impaction. In addition if the locality has a history of dusty activities, such as quarrying, a given level of additional dust may be more acceptable, i.e. more readily tolerated, than in a suburban residential area. Similarly, in rural areas agricultural activities may generate dust and this should be considered when describing baseline conditions.

For PM_{10}, Defra's background concentrations and/or any local monitoring and modelling data can be used to determine whether the 24-hour mean objective may be exceeded as a result of the construction activities. The risk of PM_{10} exceedences will be greatest at receptors very close to the site boundary, especially if combined with PM_{10} from a major road, or other source.

There is evidence that significant PM_{10} impacts can arise very close to a construction site, even one away from traffic. This is seen in results from a monitoring station in the centre of Cardiff located in a pedestrianised area. During 1994 construction took place alongside the monitor, which was 5 m away at the nearest point. The works lasted a year and involved demolition, ground works, laying of concrete foundations, erection of a steel frame and concrete floor slabs, wall and roof construction, as well as finishing. A significant impact on PM_{10} concentrations was observed (measured using a TEOM). There were 54 days when PM_{10} 24-hour concentrations exceeded 50 µg/m^3, with a maximum 24-hour value of 96 µg/m^3, compared to 12 days and a maximum of 82 µg m^3 in 1995 when there was no

construction. The greatest impact was on 1-hour PM_{10} concentrations, with 89 hours >200 µg/m^3 in 1994, compared to 11 hours in 1995. The impact on annual mean values was, however, much smaller, with PM_{10} values of 31, 34 and 25 µg/m^3 in 1993, 1994 and 1995, respectively. An analysis of the events showed that the 1 hour exceedences of 200 µg/m^3 nearly all occurred during working hours. The greatest number of high 1 hour concentrations occurring in the summer months (see: Particulate Matter in the UK, Air Quality Expert Group (AQEG), Section 6.3.6 Construction Activities, 2005). It should be noted that the mitigation measures used on the site were not recorded.

6. Assessment Procedure

Activities on construction sites have been divided into four types to reflect their different potential impacts. These are:

- demolition;
- earthworks;
- construction; and
- trackout.

The potential for dust emissions is assessed for each activity that is likely to take place. Obviously, if an activity is not taking place, e.g. demolition, then it does not need to be assessed.

The assessment methodology considers three separate dust effects:

- annoyance due to dust soiling;
- harm to ecological receptors; and
- the risk of health effects due to a significant increase in exposure to PM_{10},

with account being taken of the distance of the receptors that may experience these effects.

The assessment procedure assumes no mitigation measures are applied, except those required by legislation[9].

The conditions with no mitigation thus form the baseline or 'do-nothing' situation for a construction site (this is particularly relevant when a formal EIA is required, when impacts before and after mitigation are often assessed).

The assessment steps are summarised below and in Figure 1.

STEP 1 is to screen the requirement for a more detailed assessment.

No further assessment is required if there are no receptors within a certain distance of the works.

STEP 2 is to assess the risk of dust effects.

This is determined by:

[9] There is little legislation that explicitly seeks to control dust emissions from construction sites. Certain equipment/processes on construction sites are controlled under The Environmental Permitting (England and Wales) Regulations 2010, and equivalent legislation in Scotland and Northern Ireland, Dust is controlled indirectly, through the duty of care provisions for waste under Part 11, Environmental Protection Act 1990 (EPA) (applicable to England, Wales and Scotland) with respect to the transport of waste materials. Part III of the EPA includes provisions for Statutory Nuisance (see section 2 on Terminology). Exhaust emission from road vehicles and non-road mobile machinery are controlled through European Directives.

- the scale and nature of the works, which determines the risk of dust arising; and
- the proximity of sensitive receptors.

A description of the area around the site, in the context of potential dust effects, should be provided as part of this step.

Risks are described in terms of there being a low, medium or high risk of dust effects for each of the four separate potential activities. Where there are low, medium or high risks of effects then site-specific mitigation will be required, proportionate to the level of risk (separate guidance is provided on mitigation measures).

Based on the stated threshold criteria and professional judgement one or more of the groups of activities may be assigned a 'negligible' risk. Such cases could arise, for example, because the scale is very small and there are no receptors near to the activity.

Box 1: Guidance

This Guidance provides a framework for the assessment of risk. Professional judgement is required (see Section 11). Any judgements must be fully auditable in the dust assessment report, with the source(s) defined and the classification used to describe the magnitude of potential dust release justified in each case. Where justification cannot be given, a precautionary approach must be taken and an appropriate level of mitigation demonstrated.

STEP 3 is to determine the site-specific mitigation for each of the four potential activities used in STEP 2. This will be based on risk of dust impacts identified in STEP 2. Where a local authority has issued guidance on measures to be adopted at demolition / construction sites, these should also be taken into account.

STEP 4 is to assess the significance of the dust effects, generally undertaken after applying the site-specific mitigation. This will be based on professional judgement taking account of the risk of effects from Step 2 and of other factors that might affect the risk of dust effects arising (such as contamination or particularly sensitive receptors nearby), even after any site-specific mitigation has been implemented.

The overall significance of dust effects should be described using terminology typically used in Environmental Impact Assessment (for example 'moderate adverse').

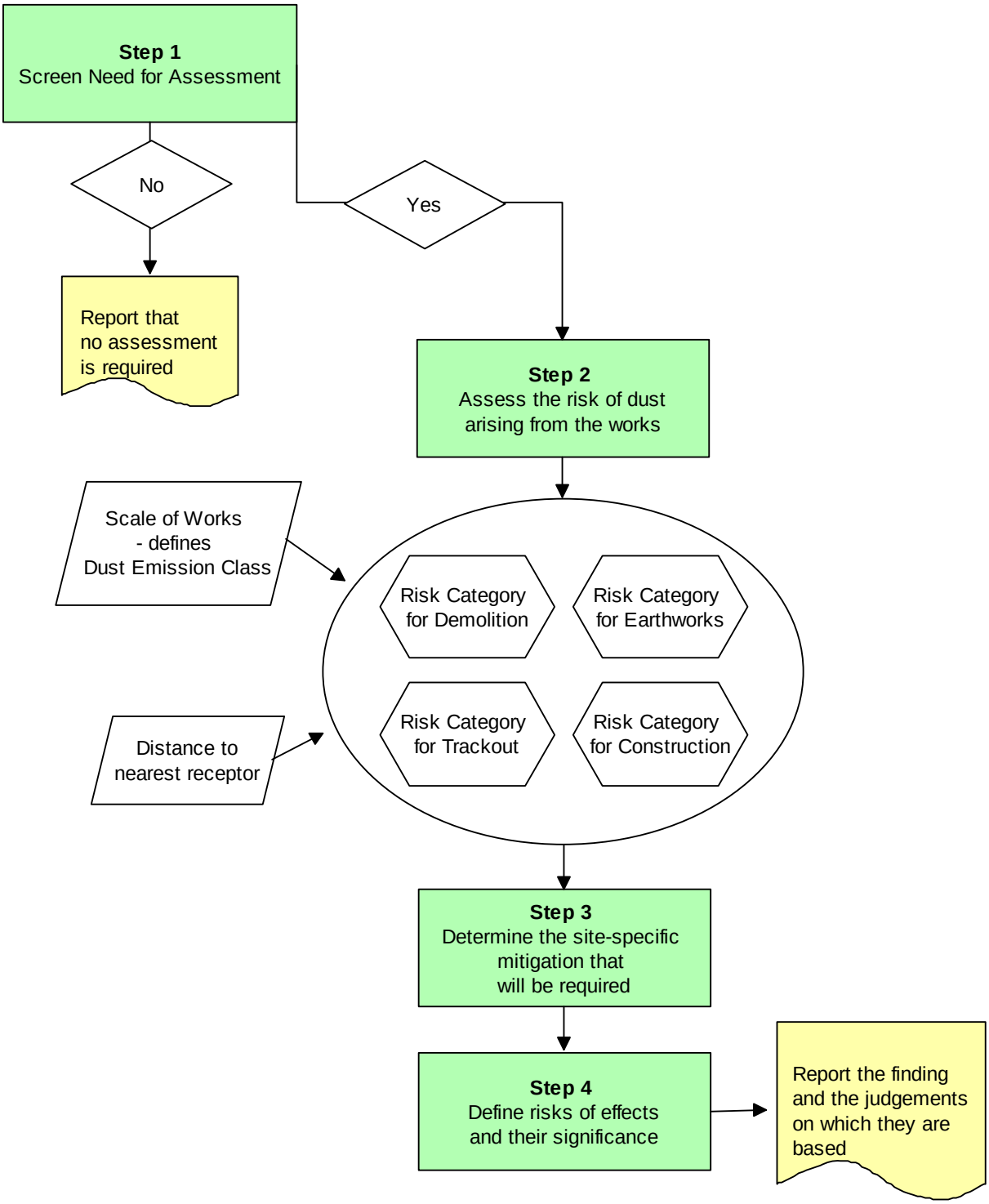

Figure 1: Steps to Perform a Dust Assessment

7. STEP 1: Screen the Need for a Detailed Assessment

Simple distance-based criteria are used to determine the requirement for a dust assessment as shown in Box 2, below.

Box 2: Step 1 – Screening Criteria

An assessment will normally be required where there are sensitive receptors within 350 m of the boundary of the site and/or within 100 m of the route(s) used by construction vehicles on the public highway, up to 500 m from the site entrance(s).

This step is deliberately chosen to be conservative, and will require assessments for most schemes. The distances cited here, and in subsequent sections, take account of the exponential decline in both airborne concentrations and the rate of deposition, as well as practical experience of members of the working Group.

Where the need for a more detailed assessment is screened out, it can be concluded that the level of risk is “negligible”.

8. STEP 2: Assess the Risk of Dust Effects Arising

8.1 Introduction

The risk of dust arising in sufficient quantities to cause annoyance and/or health or ecological effects should be determined using three risk categories: low risk, medium risk and high risk. A site is allocated to a risk category based on two factors:

- the scale and nature of the works, which determines the risk of dust arising (i.e. the magnitude of potential dust emissions) classed as: small, medium or large
- the proximity of receptors, considered separately for ecological and human receptors (i.e. the potential for effects)

Where there is doubt about the level of risk posed by a development, professional judgement should be made and the justification for this judgement stated in the report. Where there is doubt the higher risk category should be applied (e.g. if the site is assessed as low/medium then mitigation appropriate to a medium site classification should be applied).

The risk category assigned to the site can be different for each of the four potential activities (demolition, earthworks, construction and trackout). More than one of these activities may occur on a site at any one time.

Where appropriate, the site can be divided into ‘zones’ for the dust risk assessment. This may result in different mitigation levels being applied to each zone. This could be where different parts of a large site are different distances from the nearest receptors, or where development activities move away from a receptor through time on a large scheme.

However, in complex sites where activities are not easily segregated the mitigation appropriate for the highest risk category should be applied. The aim is to ensure that it is clear what mitigation is supposed to be implemented at site and to make auditing this simpler.

The Committee on the Medical Effects of Air Pollutants (COMEAP) have advised, in its report "*The Mortality Effects of Long-Term Exposure to Particulate Air Pollution in the United Kingdom*" that there is no threshold below which health effects associated with small particles do not occur. The risk categories shown below therefore represent a sliding scale of additional risk and do not consider background levels of PM_{10}.

Where background levels are high and additional PM_{10} may contribute to, or cause, an exceedence of the objective, such as in the situations below, consideration should be given to applying a higher level of mitigation:

- Sites within an air quality management area (AQMA) declared for PM_{10}[10];
- Sites in areas where the current concentration of PM_{10} is >90% of the relevant Objectives (both the annual mean and hourly PM_{10} objectives need to be considered).

It should be noted that in Scotland, where there are more stringent PM_{10} objectives than in the rest of the UK, many urban areas are already close to the objectives and therefore additional PM_{10} emissions arising from construction activities may well give rise to an exceedence.

Box 3: Professional Judgement

The following risk assessment procedure calls for 'professional judgement'. Those who are responsible for making this judgement must be able to demonstrate technical competency in the assessment of dust impacts. It is difficult to define precisely who has sufficient experience and expertise to make reasonable judgements, but, a person with full Membership of IAQM **and** experience of assessing dust impacts for a minimum of 10 diverse projects, including some complex multi-phase projects and similar projects to that being assessed, is likely to be technically competent.
IAQM is the only professional body specifically for air quality practitioners in the UK, although there are a number of more general environmental professional bodies, whose members may be competent.

8.2 Description of Site and Surroundings

It is important to provide a clear description of the proposed site activities, their location and duration, and any phasing of the development, as far as it is known at the time of the assessment.

Other factors that need to be included in the description of the site and its surroundings that define the sensitivity of the area are:

- the duration for which the sources might be close to the sensitive receptors;
- the proximity and number of receptors;
- whether there are natural shelters, such as trees, to reduce the risk of wind-blown dust;
- any specific sensitivity of the receptor(s); and
- in the case of PM_{10}, the local background concentration.

[10] Some local authorities have declared their entire administrative area as an AQMA and this will contain localised 'hotspots' and areas where PM_{10} concentrations are 'well below' (i.e. less than 75% of) the relevant Objective. This will need to be taken into account.

This should include an indication of the number of receptors at different distances from the site boundary or if known, dust generating activities) (see Tables 1 to 3, below). That is:

- less than 20 m;
- 20 to 40 m/50 m;
- 40 m/50 to 100 m; and
- more than 100 m.

The description should also include the likely routes the construction traffic will use and the receptors that meet the trackout criteria in Table 4, below.

Exact counting of the number of receptors, is not required. Instead it is recommended that judgement is used to determine the approximate number of receptors (a residential unit is one receptor) within each distance band, as follows:

- fewer than 10 receptors;
- 10-100 receptors;
- 100-500 receptors;
- more than 500 receptors.

8.3 Demolition

Every site is different in terms of timing (seasonality), building type (construction materials), duration and scale (area, volume and height), and therefore expert judgement must be applied when allocating demolition activities into one of the three potential dust emission classes.

The following are examples of the potential dust emission classes (note that not all the criteria need to be met for a particular class), other criteria may be used if justified in the assessment:

- **Large**: Total building volume >50 000 m^3, potentially dusty construction material (e.g. concrete), on-site crushing and screening, demolition activities >20 m above ground level;
- **Medium**: Total building volume 20 000 m^3 – 50 000m^3, potentially dusty construction material, demolition activities 10-20 m above ground level; and
- **Small**: Total building volume <20 000 m^3, construction material with low potential for dust release (e.g. metal cladding or timber), demolition activities <10m above ground, demolition during wetter months.

The potential dust emission class determined above should be used in the matrix in Table 1 to determine the **demolition risk category** with no mitigation applied (high, low or medium risk) based on the distance to the nearest receptors. This varies depending on the different effects under consideration.

Table 1: Risk Category from Demolition Activities

Distance to Nearest Receptor (m)[a]		Dust Emission Class		
Dust Soiling and PM_{10}	**Ecological**	**Large**	**Medium**	**Small**
<20	**-**	High Risk Site	High Risk Site	Medium Risk Site
20 - 100	**<20**	High Risk Site	Medium Risk Site	Low Risk Site
100 - 200	**20 - 40**	Medium Risk Site	Low Risk Site	Low Risk Site
200 - 350	**40 - 100**	Medium Risk Site	Low Risk Site	Negligible

[a] These distances are from the dust emission source. Where this is not known then the distance should be from the site boundary. The risk is based on the distance to the nearest receptor.

The demolition risk category should be used as a guide for determining the level of mitigation that must be applied. Mitigation is discussed in Step 3 (Section 9). For those cases where the risk category is 'negligible', no mitigation measures will be required.

Box 4: Crushing and Screening

Mobile crushing equipment can be a significant source of dust associated with the demolition phase. This equipment is regulated by District Councils or Unitary Authorities in England and Wales, SEPA in Scotland and District Councils in Northern Ireland, under the Environmental Permitting Regulations 2010 in England and Wales, and equivalent legislation in Scotland and Northern Ireland.
Equipment should be designed and operated in accordance with Process Guidance Note 3/16 (04) for Mobile Crushing and Screening (note this is under review). Operation of such equipment should be considered when classifying the site activities into a potential dust emission class**.**

8.4 Earthworks

Earthworks will primarily involve excavating material, haulage, tipping and stockpiling. This may also involve levelling the site and landscaping.

Every site is different in terms of timing (seasonality), geology, topography and duration and therefore professional judgement must be applied when classifying the earthworks' activities.

The following are examples of the potential dust emission classes (note that not all the criteria need to be met for a particular class); other criteria may be used if justified in the assessment:

- **Large**: Total site area >10 000 m^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 >8 m in height, total material moved >100 000 tonnes;

- **Medium**: Total site area 2 500 m^2 – 10 000 m^2, moderately dusty soil type (e.g. silt), 5-10 heavy earth moving vehicles active at any one time, formation of bunds 4 m - 8 m in height, total material moved 20 000 tonnes – 100 000 tonnes; and
- **Small**: Total site area <2 500 m^2, soil type with large grain size (e.g. sand), <5 heavy earth moving vehicles active at any one time, formation of bunds <4 m in height, total material moved <10 000 tonnes, earthworks during wetter months.

These potential dust emission classes should then be used in the matrix in Table 2 to determine the **earthworks risk category** with no mitigation applied.

Table 2: Risk Category from Earthworks Activities

Distance to Nearest Receptor (m)[a]		Dust Emission Class		
Dust Soiling and PM_{10}	**Ecological**	**Large**	**Medium**	**Small**
<20	**-**	High Risk Site	High Risk Site	Medium Risk Site
20 - 50	**-**	High Risk Site	Medium Risk Site	Low Risk Site
50 - 100	**<20**	Medium Risk Site	Medium Risk Site	Low Risk Site
100 - 200	**20 - 40**	Medium Risk Site	Low Risk Site	Negligible
200 - 350	**40 - 100**	Low Risk Site	Low Risk Site	Negligible

[a] These distances are from the dust emission source. Where this is not known then the distance should be from the site boundary. The risk is based on the distance to the nearest receptor.

Box 5 Importance of Dust Raised by Vehicles

Research carried out using the United States Environmental Protection Agency's (EPA) emission factors for unpaved haul roads (http://www.epa.gov/ttnchie1/ap42/), has shown that haul trucks generate the majority of dust emissions from surface mining sites, accounting for an estimated 78%-97% of total dust emissions. Vehicles using unpaved haul roads in UK construction sites will lead to the release of dust via the same mechanical processes (i.e. re-suspension) and are likely to be a dominant source. Emissions will also arise from vehicles travelling over any unpaved ground on a construction site.

8.5 Construction

The key issues when determining the potential dust emission class during the construction phase include the size of the building(s)/infrastructure, method of construction, construction materials, and duration of build. Every site is different in terms of timing (seasonality), building type, duration, scale (volume and height) and therefore professional judgement must

be applied when classifying the construction activities into one of the three magnitude classes.

The following are examples of the potential dust emission classes (note that not all the criteria need to be met for a particular class); other criteria may be used if justified in the assessment:

- **Large**: Total building volume >100 000 m^3, piling, on site concrete batching; sandblasting
- **Medium**: Total building volume 25 000 m^3 – 100 000 m^3, potentially dusty construction material (e.g. concrete), piling, on site concrete batching; and
- **Small**: Total building volume <25 000 m^3, construction material with low potential for dust release (e.g. metal cladding or timber).

This categorisation should then be used in the matrix shown in Table 3 to determine the **construction risk category** with no mitigation applied.

Table 3: Risk Category from Construction Activities

Distance to Nearest Receptor (m)[a]		Dust Emission Class		
Dust Soiling and PM_{10}	**Ecological**	**Large**	**Medium**	**Small**
<20	**-**	High Risk Site	High Risk Site	Medium Risk Site
20 - 50	**-**	High Risk Site	Medium Risk Site	Low Risk Site
50 - 100	**<20**	Medium Risk Site	Medium Risk Site	Low Risk Site
100 - 200	**20 - 40**	Medium Risk Site	Low Risk Site	Negligible
200 - 350	**40 - 100**	Low Risk Site	Low Risk Site	Negligible

[a] These distances are from the dust emission source. Where this is not known then the distance should be from the site boundary. The risk is based on the distance to the nearest receptor.

Box 6 Concrete Batching Plant

Concrete batching equipment is regulated by District Councils or Unitary Authorities in England and Wales, SEPA in Scotland and District Councils in Northern Ireland under the Environmental Permitting Regulations 2010 and equivalent legislation in Scotland and Northern Ireland.
Such equipment should be operated in accordance with Process Guidance Note 3/1 (04) on Guidance for Blending, Packing, Loading, Unloading and Use of Bulk Cement. Operation of such equipment may also be considered when classifying the site activities into magnitude class.

8.6 Trackout

Factors which determine the magnitude class are vehicle size, vehicle speed, vehicle numbers, geology and duration. As with all other potential sources, professional judgement must be applied when classifying trackout into one of the magnitude categories.

As described in Box 2, only receptors within 100 m of the route(s) used by vehicles on the public highway and up to 500 m from the site entrance(s) are considered to be at risk and the risk classification distances shown in Table 4 reflect this.

The following are examples of the potential dust emission classes (note that not all the criteria need to be met for a particular class); other criteria may be used if justified in the assessment:

- **Large**: >100 HDV (>3.5t) trips in any one day, potentially dusty surface material (e.g. high clay content), unpaved road length >100 m;
- **Medium**: 25-100 HDV (>3.5t) trips in any one day, moderately dusty surface material (e.g. high clay content), unpaved road length 50m – 100 m; and
- **Small** / **Medium**: <25 HDV (>3.5t) trips in any one day, surface material with low potential for dust release, unpaved road length <50 m.

These numbers are for vehicles that leave the site after moving over unpaved ground, where they will accumulate mud and dirt that can be tracked out onto the public highway.

These potential dust emission classes should be used in Table 4 to determine the **trackout risk category** with no mitigation applied.

Table 4: Risk Category from Trackout

Distance to Nearest Receptor (m)[a]		Dust Emission Class		
Dust Soiling and PM_{10}	**Ecological**	**Large**	**Medium**	**Small**
<20	**-**	High Risk Site	Medium Risk Site	Medium Risk Site
20 - 50	**<20**	Medium Risk Site	Medium Risk Site	Low Risk Site
50 - 100	**20 - 100**	Low Risk Site	Low Risk Site	Negligible

[a] For trackout the distance is from the roads used by construction traffic.

There is an extra dimension to the assessment of trackout, as the distance over which it might occur depends on the site. As general guidance, significant trackout may occur up to 500 m from large sites, 200 m from medium sites and 50 m from small sites, as measured from the site exit. These distances assume no site-specific mitigation.

The 'distance to receptor' in Table 4 relates to the distance from the road where mud may be deposited. Therefore in determining the risk from trackout, both distances need to be taken into account.

8.7 Summary of the Risk of Dust Effects

The risk categories for the four activities can usefully be summarised in a table setting out the risks of effects. An example of a completed risk effects table is provided in Table 5:

Table 5: Example of a Summary Risk Effects Table with No Mitigation

Source	Dust Soiling and PM_{10} Effects	Ecological Effects
Demolition	High Risk Site	None
Earthworks	Medium Risk Site	None
Construction	Low Risk Site	None
Trackout	Medium Risk Site	None

9. STEP 3: Identify the Need for Site-specific Mitigation

Having determined the risk categories for each of the four activities it is possible to determine the site-specific measures to be adopted. These measures will be related to whether the site is a low, medium or high risk site. Mitigation measures for London are set out in *The Control of Dust and Emissions from Construction and Demolition: Best Practice Guidance,* published in 2006, and *due to be revised in 2012.* Most of these measures are likely to be suitable for demolition / construction projects outside the capital.

For those cases where the risk is assigned as 'negligible', no mitigation measures beyond those required by legislation are required.

Given the variety of development sites and the individual issues they face, professional judgement should be used to determine the site-specific mitigation measures to be applied. These will need to be written into a dust management plan (DMP), which should be approved with the local planning authority and environmental health department prior to commencement of work on site. For major sites the DMP may be integrated into a Code of Construction Practice or the Construction Environmental Management Plan, and may require monitoring.

One of the most importance aspects of the DMP is assigning responsibly for dust management to an individual member of staff of the principal contractor and training staff to understand the importance of the issue.

10. STEP 4: Define Effects and their Significance

Step 2 describes the site and its surroundings and provides a method for determining the risk of a dust effect occurring. Step 3 identifies appropriate site-specific mitigation. Once these steps have been completed the significance of the potential dust effects should be determined.

The significance is best determined using professional judgement, taking account of the factors that define the sensitivity of the surrounding area (see Section 8.2) and the overall pattern of potential risks set out within the risk effects summary table (see Table 5 for an example). The sensitivity of the area needs to be defined. Examples are given in Table 6.

Table 6: Examples of Factors Defining Sensitivity of an Area

Sensitivity of Surrounding Area	Examples	
	Human Receptors	**Ecological Receptors**[a]
Very high	Very densely populated area. More than 100 dwellings within 20 m. Local PM_{10} concentrations exceed the objective. Contaminated buildings present. Very sensitive receptors (e.g. oncology units). Works continuing in one area of the site for more than one year.	European Designated site.
High	Densely populated area. 10-100 dwellings within 20 m of site. Local PM_{10} concentrations close to the objective (e.g. annual mean 36-40 µg/m^3). Commercially sensitive horticultural land within 20m.	Nationally Designated site.
Medium	Suburban or edge of town area. Less than 10 dwellings within 20 m. Local PM_{10} concentrations below the objective (e.g. annual mean 30-36 µg/m^3).	Locally designated site.
Low	Rural area; industrial area No dwellings within 20 m Local PM_{10} concentrations well below the objectives (less than 75%) Wooded area between site and receptors	No designations.

[a] Only if there are habitats that might be sensitive to dust

The choice of area type should be justified in the assessment report.
The sensitivity of the area surrounding the construction / demolition site is combined with the risk of the site giving rise to dust effects (from Step 2) to define the significance of the effects for each of the four activities (demolition, earthworks, construction and trackout).

Traditionally, EIAs evaluated the significance of significant adverse effects prior to mitigation and re-evaluated them post mitigation following a consideration of the anticipated effectiveness of the proposed mitigation measures. Research by the Institute of Environmental Management & Assessment (IEMA) has found that the many UK EIA practitioners no longer adopt this approach because EIA influences the design process, and any significant adverse environmental effects are either avoided or reduced through design before the proposal is finalised, and thus the impacts pre-mitigation are not relevant[11]. Instead, just the residual impacts are reported. This approach assumes that all actions to avoid or reduce the environmental effects are an inherent part of the proposed development or will not occur because migratory measures during demolition and/or construction (secured by planning conditions, legal requirements or required by regulations) will ensure a potential significant adverse effect will not occur to that extent.

The Highways Agency has adopted this approach for road schemes in England, but thus far not in Scotland and Wales[12]. The key to such as approach is that it assumes that the "Overseeing Organisation/Competent Authority" will ensure all mitigation measures are successfully implemented. For other types of developments, the IEMA report suggests that rigorous systems to check that post-consent mitigation is delivered may not exist.

The preference in this Guidance is to only assign significance to the impact with mitigation. It is, therefore, important that the mitigation measures are defined in a form suitable for implementation by way of a planning condition or legal obligation within a section 106, and are included in a Dust Management Plan (DMP) or a more general (Demolition or Construction) Environmental Management Plan.

Even with a rigorous DMP in place, it is not possible to guarantee that the dust mitigation measures will be effective all the time, and if, for example, dust emissions occur under adverse weather conditions, or there is an interruption to the water supply used for dust suppression, the local community may experience occasional, short term dust annoyance. For medium and high risk sites in highly or very highly sensitive areas there may be a slight adverse residual effect.

However, as appropriate site-specific mitigation measures will have been defined (in Step 3), the residual impact will, for most sites, be negligible as shown in Table 7.

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11 Special Report – State of the Environmental Impact Assessment Practice in the UK, Institute of Environmental Management & Assessment, June 2011

12 Design Manual for Roads and Bridges, Volume 11, Section 2, Part 5, HA 205/08, Highways Agency, August 2008

Table 7: Significance of Effects for Each Activity with Mitigation

Sensitivity of Surrounding Area	Risk of Site Giving Rise to Dust Effects		
	High	Medium	Low
Very High	Slight adverse	Slight adverse	Negligible
High	Slight adverse	Negligible	Negligible
Medium	Negligible	Negligible	Negligible
Low	Negligible	Negligible	Negligible

When the EIA co-ordinator requests that the significance of the effects without mitigation be included, the recommended significance criteria in Table 8 should be used.

It should be noted that the words and number of categories should be consistent with those used throughout the ES, and therefore some modification to this terminology may be necessary in some circumstances.

Table 8: Significance of Effects for Each Activity with No Mitigation

Sensitivity of Surrounding Area	Risk of Site Giving Rise to Dust Effects		
	High	Medium	Low
Very High	Substantial adverse	Moderate adverse	Moderate adverse
High	Moderate adverse	Moderate adverse	Slight adverse
Medium	Moderate adverse	Slight adverse	Negligible
Low	Slight Adverse	Negligible	Negligible

The final step is to determine the overall significance of the effects arising from the construction phase of a proposed development. This will be based on professional judgement but should take account of the significance of the effects for each of the four activities. The latter can usefully be presented in tabular form such as is set out in Table 9 and Table 10.

Table 9 provides an example of an overall summary table that might be presented for a site in a highly sensitive area with respect to human receptors for a medium risk site with little earthworks, and with mitigation applied.

Table 9: Example of a Summary Significance Table with Mitigation

Source	Dust Soiling and PM_{10} Effects	Ecological Effects	PM_{10} Effects
Demolition	Slight adverse	None	Slight adverse
Earthworks	Negligible	None	Negligible
Construction	Slight adverse	None	Negligible
Trackout	Slight adverse	None	Negligible
Overall Significance		**Slight adverse**	

Table 10 provides an example of an overall summary table that might be presented for a site in a highly sensitive with respect to human receptors for a medium risk site with little earthworks and with no mitigation applied.

Table 10: Example of a Summary Significance Table with No Mitigation

Source	Dust Soiling Effects	Ecological Effects	PM_{10} Effects
Demolition	Moderate adverse	None	Moderate adverse
Earthworks	Slight adverse	None	Negligible
Construction	Moderate adverse	None	Negligible
Trackout	Moderate adverse	None	Negligible
Overall Significance		**Moderate adverse**	

11. Professional Judgement

Throughout this document reference is made to the use of professional judgement. This is necessary, because the diverse range of projects that are likely to be subject to dust impact assessment means that it is not possible to be prescriptive as to how to assess the impacts. Also a wide range of factors affect the amount of dust that may arise, and these are not readily quantified. This document provides a framework to ensure that assessments are more consistent and consider the full range of potential impacts.

These impacts are often considered to be relatively unimportant compared to assessments of the operational air quality impacts. However, IAQM considers that it requires a level of experience and skill to produce a fit for purpose assessment, and therefore it should be undertaken by, or under the close supervision of, an experienced practitioner. Those who are making the professional judgment must be able to demonstrate technical competency in the assessment of dust impacts. For example, a person with full Membership of IAQM **and** with experience of assessing dust impacts for a minimum of 10 diverse projects, including some complex multi-phase projects and similar projects to that being assessed, is likely to be technically competent. The IAQM is the only UK professional body specifically for air quality practitioners although there are a number of more general environmental professional organisations, whose members may also be competent.

Where possible the name of the assessor and/or supervisor should be included in the assessment report, with a brief summary of their relevant qualifications and experience.