

# Infinity Garden Village (Wragley Way)

## ENVIRONMENTAL STATEMENT

### Volume 3

### Appendices and Figures to the Main Technical Studies

June 2019



**Hallam Land  
Management**



## **Volume 3: Appendices**

### **Chapter K: Air Quality**

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May 2019



Experts in air quality  
management & assessment

## Document Control

|               |                        |                          |                  |
|---------------|------------------------|--------------------------|------------------|
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|                   |       |
|-------------------|-------|
| <b>Job Number</b> | J3746 |
|-------------------|-------|

|                            |                                  |
|----------------------------|----------------------------------|
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### Document Status and Review Schedule

| Report No.  | Date        | Status | Reviewed by                          |
|-------------|-------------|--------|--------------------------------------|
| J3746A/1/F1 | 28 May 2019 | Final  | Dr Denise Evans (Associate Director) |

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## A1 Construction Dust Assessment Procedure

A1.1 The criteria developed by IAQM<sup>1</sup> divide the activities on construction sites into four types to reflect their different potential impacts. These are:

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

A1.2 The assessment procedure includes the four steps summarised below:

### STEP 1: Screen the Need for a Detailed Assessment

A1.3 An assessment is required where there is a human receptor within 350 m of the boundary of the site and/or within 50 m of the route(s) used by construction vehicles on the public highway, up to 500 m from the site entrance(s), or where there is an ecological receptor within 50 m of the boundary of the site and/or within 50 m of the route(s) used by construction vehicles on the public highway, up to 500 m from the site entrance(s).

A1.4 Where the need for a more detailed assessment is screened out, it can be concluded that the level of risk is *negligible* and that any effects will be 'not significant'. No mitigation measures beyond those required by legislation will be required.

### STEP 2: Assess the Risk of Dust Impacts

A1.5 A site is allocated to a risk category based on two factors:

- the scale and nature of the works, which determines the potential dust emission magnitude (Step 2A); and
- the sensitivity of the area to dust effects (Step 2B).

A1.6 These two factors are combined in Step 2C, which is to determine the risk of dust impacts with no mitigation applied. The risk categories assigned to the site may be different for each of the four potential sources of dust (demolition, earthworks, construction and trackout).

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<sup>1</sup> IAQM (2016) Guidance on the Assessment of Dust from Demolition and Construction v1.1, Available: <http://iaqm.co.uk/guidance/>.

### ***Step 2A – Define the Potential Dust Emission Magnitude***

A1.7 Dust emission magnitude is defined as either ‘Small’, ‘Medium’, or ‘Large’. The IAQM guidance explains that this classification should be based on professional judgement, but provides the examples in Table A1.1.

**Table A1.1: Examples of How the Dust Emission Magnitude Class May be Defined**

| Class                        | Examples                                                                                                                                                                                                                                                                                 |
|------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Demolition</b>            |                                                                                                                                                                                                                                                                                          |
| <b>Large</b>                 | Total building volume >50,000 m <sup>3</sup> , potentially dusty construction material (e.g. concrete), on site crushing and screening, demolition activities >20 m above ground level                                                                                                   |
| <b>Medium</b>                | Total building volume 20,000 m <sup>3</sup> – 50,000 m <sup>3</sup> , potentially dusty construction material, demolition activities 10-20 m above ground level                                                                                                                          |
| <b>Small</b>                 | Total building volume <20,000 m <sup>3</sup> , construction material with low potential for dust release (e.g. metal cladding or timber), demolition activities <10 m above ground, demolition during wetter months                                                                      |
| <b>Earthworks</b>            |                                                                                                                                                                                                                                                                                          |
| <b>Large</b>                 | Total site area >10,000 m <sup>2</sup> , potentially dusty soil type (e.g. clay, which will be prone to suspension when dry to due 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 |
| <b>Medium</b>                | Total site area 2,500 m <sup>2</sup> – 10,000 m <sup>2</sup> , 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                              |
| <b>Small</b>                 | Total site area <2,500 m <sup>2</sup> , 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                                      |
| <b>Construction</b>          |                                                                                                                                                                                                                                                                                          |
| <b>Large</b>                 | Total building volume >100,000 m <sup>3</sup> , piling, on site concrete batching; sandblasting                                                                                                                                                                                          |
| <b>Medium</b>                | Total building volume 25,000 m <sup>3</sup> – 100,000 m <sup>3</sup> , potentially dusty construction material (e.g. concrete), piling, on site concrete batching                                                                                                                        |
| <b>Small</b>                 | Total building volume <25,000 m <sup>3</sup> , construction material with low potential for dust release (e.g. metal cladding or timber)                                                                                                                                                 |
| <b>Trackout <sup>a</sup></b> |                                                                                                                                                                                                                                                                                          |
| <b>Large</b>                 | >50 HDV (>3.5t) outward movements in any one day, potentially dusty surface material (e.g. high clay content), unpaved road length >100 m                                                                                                                                                |
| <b>Medium</b>                | 10-50 HDV (>3.5t) outward movements in any one day, moderately dusty surface material (e.g. high clay content), unpaved road length 50 m – 100 m                                                                                                                                         |
| <b>Small</b>                 | <10 HDV (>3.5t) outward movements in any one day, surface material with low potential for dust release, unpaved road length <50 m                                                                                                                                                        |

<sup>a</sup> These numbers are for vehicles that leave the site after moving over unpaved ground.

### ***Step 2B – Define the Sensitivity of the Area***

A1.8 The sensitivity of the area is defined taking account of a number of factors:

- the specific sensitivities of receptors in the area;
- the proximity and number of those receptors;
- in the case of PM<sub>10</sub>, the local background concentration; and
- site-specific factors, such as whether there are natural shelters to reduce the risk of wind-blown dust.

A1.9 The first requirement is to determine the specific sensitivities of local receptors. The IAQM guidance recommends that this should be based on professional judgment, taking account of the principles in Table A1.2. These receptor sensitivities are then used in the matrices set out in Table A1.3, Table A1.4 and Table A1.5 to determine the sensitivity of the area. Finally, the sensitivity of the area is considered in relation to any other site-specific factors, such as the presence of natural shelters etc., and any required adjustments to the defined sensitivities are made.

### ***Step 2C – Define the Risk of Impacts***

A1.10 The dust emission magnitude determined at Step 2A is combined with the sensitivity of the area determined at Step 2B to determine the *risk* of impacts with no mitigation applied. The IAQM guidance provides the matrix in Table A1.6 as a method of assigning the level of risk for each activity.

## **STEP 3: Determine Site-specific Mitigation Requirements**

A1.11 The IAQM guidance provides a suite of recommended and desirable mitigation measures which are organised according to whether the outcome of Step 2 indicates a low, medium, or high risk. The list provided in the IAQM guidance has been used as the basis for the requirements set out in Appendix A4.

## **STEP 4: Determine Significant Effects**

A1.12 The IAQM guidance does not provide a method for assessing the significance of effects before mitigation, and advises that pre-mitigation significance should not be determined. With appropriate mitigation in place, the IAQM guidance is clear that the residual effect will normally be 'not significant'.

A1.13 The IAQM guidance recognises that, even with a rigorous dust management plan in place, it is not possible to guarantee that the dust mitigation measures will be effective all of the time, for instance under adverse weather conditions. The local community may therefore experience occasional, short-term dust annoyance. The scale of this would not normally be considered sufficient to change the conclusion that the effects will be 'not significant'.

**Table A1.2: Principles to be Used When Defining Receptor Sensitivities**

| Class                                                                   | Principles                                                                                                                                                                                                                                                                                                                                                                                                                  | Examples                                                                                                               |
|-------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------|
| <b>Sensitivities of People to Dust Soiling Effects</b>                  |                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                        |
| <b>High</b>                                                             | users can reasonably expect enjoyment of a high level of amenity; or<br>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                                                                              | dwellings, museum and other culturally important collections, medium and long term car parks and car showrooms         |
| <b>Medium</b>                                                           | 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<br>the appearance, aesthetics or value of their property could be diminished by soiling; or<br>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 | parks and places of work                                                                                               |
| <b>Low</b>                                                              | the enjoyment of amenity would not reasonably be expected; or<br>there is property that would not reasonably be expected to be diminished in appearance, aesthetics or value by soiling; or<br>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                                       | playing fields, farmland (unless commercially-sensitive horticultural), footpaths, short term car parks and roads      |
| <b>Sensitivities of People to the Health Effects of PM<sub>10</sub></b> |                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                        |
| <b>High</b>                                                             | locations where members of the public may be exposed for eight hours or more in a day                                                                                                                                                                                                                                                                                                                                       | residential properties, hospitals, schools and residential care homes                                                  |
| <b>Medium</b>                                                           | locations where the people exposed are workers, and where individuals may be exposed for eight hours or more in a day.                                                                                                                                                                                                                                                                                                      | may include office and shop workers, but will generally not include workers occupationally exposed to PM <sub>10</sub> |
| <b>Low</b>                                                              | locations where human exposure is transient                                                                                                                                                                                                                                                                                                                                                                                 | public footpaths, playing fields, parks and shopping streets                                                           |
| <b>Sensitivities of Receptors to Ecological Effects</b>                 |                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                        |
| <b>High</b>                                                             | locations with an international or national designation and the designated features may be affected by dust soiling; or<br>locations where there is a community of a particularly dust sensitive species                                                                                                                                                                                                                    | Special Areas of Conservation with dust sensitive features                                                             |
| <b>Medium</b>                                                           | locations where there is a particularly important plant species, where its dust sensitivity is uncertain or unknown; or<br>locations with a national designation where the features may be affected by dust deposition                                                                                                                                                                                                      | Sites of Special Scientific Interest with dust sensitive features                                                      |
| <b>Low</b>                                                              | locations with a local designation where the features may be affected by dust deposition                                                                                                                                                                                                                                                                                                                                    | Local Nature Reserves with dust sensitive features                                                                     |

**Table A1.3: Sensitivity of the Area to Dust Soiling Effects on People and Property <sup>2</sup>**

| Receptor Sensitivity | Number of Receptors | Distance from the Source (m) |        |        |      |
|----------------------|---------------------|------------------------------|--------|--------|------|
|                      |                     | <20                          | <50    | <100   | <350 |
| 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  |

<sup>2</sup> For demolition, earthworks and construction, distances are taken either from the dust source or from the boundary of the site. For trackout, distances are measured from the sides of roads used by construction traffic. Without mitigation, trackout may occur from roads up to 500 m from sites with a *large* dust emission magnitude, 200 m from sites with a *medium* dust emission magnitude and 50 m from sites with a *small* dust emission magnitude, as measured from the site exit. 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 A1.4: Sensitivity of the Area to Human Health Effects <sup>2</sup>

| Receptor Sensitivity | Annual Mean PM <sub>10</sub> | Number of Receptors | Distance from the Source (m) |        |        |        |      |
|----------------------|------------------------------|---------------------|------------------------------|--------|--------|--------|------|
|                      |                              |                     | <20                          | <50    | <100   | <200   | <350 |
| High                 | >32 µg/m <sup>3</sup>        | >100                | High                         | High   | High   | Medium | Low  |
|                      |                              | 10-100              | High                         | High   | Medium | Low    | Low  |
|                      |                              | 1-10                | High                         | Medium | Low    | Low    | Low  |
|                      | 28-32 µg/m <sup>3</sup>      | >100                | High                         | High   | Medium | Low    | Low  |
|                      |                              | 10-100              | High                         | Medium | Low    | Low    | Low  |
|                      |                              | 1-10                | High                         | Medium | Low    | Low    | Low  |
|                      | 24-28 µg/m <sup>3</sup>      | >100                | High                         | Medium | Low    | Low    | Low  |
|                      |                              | 10-100              | High                         | Medium | Low    | Low    | Low  |
|                      |                              | 1-10                | Medium                       | Low    | Low    | Low    | Low  |
|                      | <24 µg/m <sup>3</sup>        | >100                | Medium                       | Low    | Low    | Low    | Low  |
|                      |                              | 10-100              | Low                          | Low    | Low    | Low    | Low  |
|                      |                              | 1-10                | Low                          | Low    | Low    | Low    | Low  |
| Medium               | >32 µg/m <sup>3</sup>        | >10                 | High                         | Medium | Low    | Low    | Low  |
|                      |                              | 1-10                | Medium                       | Low    | Low    | Low    | Low  |
|                      | 28-32 µg/m <sup>3</sup>      | >10                 | Medium                       | Low    | Low    | Low    | Low  |
|                      |                              | 1-10                | Low                          | Low    | Low    | Low    | Low  |
|                      | 24-28 µg/m <sup>3</sup>      | >10                 | Low                          | Low    | Low    | Low    | Low  |
|                      |                              | 1-10                | Low                          | Low    | Low    | Low    | Low  |
|                      | <24 µg/m <sup>3</sup>        | >10                 | Low                          | Low    | Low    | Low    | Low  |
|                      |                              | 1-10                | Low                          | Low    | Low    | Low    | Low  |
| Low                  | -                            | >1                  | Low                          | Low    | Low    | Low    | Low  |

Table A1.5: Sensitivity of the Area to Ecological Effects <sup>2</sup>

| Receptor Sensitivity | Distance from the Source (m) |        |
|----------------------|------------------------------|--------|
|                      | <20                          | <50    |
| High                 | High                         | Medium |
| Medium               | Medium                       | Low    |
| Low                  | Low                          | Low    |

**Table A1.6: Defining the Risk of Dust Impacts**

| Sensitivity of the Area | Dust Emission Magnitude |             |             |
|-------------------------|-------------------------|-------------|-------------|
|                         | Large                   | Medium      | Small       |
| <b>Demolition</b>       |                         |             |             |
| <b>High</b>             | High Risk               | Medium Risk | Medium Risk |
| <b>Medium</b>           | High Risk               | Medium Risk | Low Risk    |
| <b>Low</b>              | Medium Risk             | Low Risk    | Negligible  |
| <b>Earthworks</b>       |                         |             |             |
| <b>High</b>             | High Risk               | Medium Risk | Low Risk    |
| <b>Medium</b>           | Medium Risk             | Medium Risk | Low Risk    |
| <b>Low</b>              | Low Risk                | Low Risk    | Negligible  |
| <b>Construction</b>     |                         |             |             |
| <b>High</b>             | High Risk               | Medium Risk | Low Risk    |
| <b>Medium</b>           | Medium Risk             | Medium Risk | Low Risk    |
| <b>Low</b>              | Low Risk                | Low Risk    | Negligible  |
| <b>Trackout</b>         |                         |             |             |
| <b>High</b>             | High Risk               | Medium Risk | Low Risk    |
| <b>Medium</b>           | Medium Risk             | Low Risk    | Negligible  |
| <b>Low</b>              | Low Risk                | Low Risk    | Negligible  |

## A2 EPUK & IAQM Planning for Air Quality Guidance

- A2.1 The guidance issued by EPUK and IAQM<sup>3</sup> is comprehensive in its explanation of the place of air quality in the planning regime. Key sections of the guidance not already mentioned above are set out below.

### Air Quality as a Material Consideration

*“Any air quality issue that relates to land use and its development is capable of being a material planning consideration. The weight, however, given to air quality in making a planning application decision, in addition to the policies in the local plan, will depend on such factors as:*

- *the severity of the impacts on air quality;*
- *the air quality in the area surrounding the proposed development;*
- *the likely use of the development, i.e. the length of time people are likely to be exposed at that location; and*
- *the positive benefits provided through other material considerations”.*

### Recommended Best Practice

- A2.2 The guidance goes into detail on how all development proposals can and should adopt good design principles that reduce emissions and contribute to better air quality management. It states:

*“The basic concept is that good practice to reduce emissions and exposure is incorporated into all developments at the outset, at a scale commensurate with the emissions”.*

- A2.3 The guidance sets out a number of good practice principles that should be applied to all developments that:

- include 10 or more dwellings;
- where the number of dwellings is not known, residential development is carried out on a site of more than 0.5 ha;
- provide more than 1,000 m<sup>2</sup> of commercial floorspace;
- are carried out on land of 1 ha or more.

- A2.4 The good practice principles are that:

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<sup>3</sup> Moorcroft and Barrowcliffe et al (2017) Land-Use Planning & Development Control: Planning For Air Quality v1.2, IAQM, London, Available: <http://iaqm.co.uk/guidance/>.

- New developments should not contravene the Council's Air Quality Action Plan, or render any of the measures unworkable;
- Wherever possible, new developments should not create a new "street canyon", as this inhibits pollution dispersion;
- Delivering sustainable development should be the key theme of any application;
- New development should be designed to minimise public exposure to pollution sources, e.g. by locating habitable rooms away from busy roads;
- The provision of at least 1 Electric Vehicle (EV) "rapid charge" point per 10 residential dwellings and/or 1000 m<sup>2</sup> of commercial floorspace. Where on-site parking is provided for residential dwellings, EV charging points for each parking space should be made available;
- Where development generates significant additional traffic, provision of a detailed travel plan (with provision to measure its implementation and effect) which sets out measures to encourage sustainable means of transport (public, cycling and walking) via subsidised or free-ticketing, improved links to bus stops, improved infrastructure and layouts to improve accessibility and safety;

A2.5 The guidance also outlines that offsetting emissions might be used as a mitigation measure for a proposed development. However, it states that:

*"It is important that obligations to include offsetting are proportional to the nature and scale of development proposed and the level of concern about air quality; such offsetting can be based on a quantification of the emissions associated with the development. These emissions can be assigned a value, based on the "damage cost approach" used by Defra, and then applied as an indicator of the level of offsetting required, or as a financial obligation on the developer. Unless some form of benchmarking is applied, it is impractical to include building emissions in this approach, but if the boiler and CHP emissions are consistent with the standards as described above then this is not essential".*

A2.6 The guidance offers a widely used approach for quantifying costs associated with pollutant emissions from transport. It also outlines the following typical measures that may be considered to offset emissions, stating that measures to offset emissions may also be applied as post assessment mitigation:

- Support and promotion of car clubs;
- Contributions to low emission vehicle refuelling infrastructure;
- Provision of incentives for the uptake of low emission vehicles;
- Financial support to low emission public transport options; and

- Improvements to cycling and walking infrastructures.

## Screening

### ***Impacts of the Local Area on the Development***

*“There may be a requirement to carry out an air quality assessment for the impacts of the local area’s emissions on the proposed development itself, to assess the exposure that residents or users might experience. This will need to be a matter of judgement and should take into account:*

- *the background and future baseline air quality and whether this will be likely to approach or exceed the values set by air quality objectives;*
- *the presence and location of Air Quality Management Areas as an indicator of local hotspots where the air quality objectives may be exceeded;*
- *the presence of a heavily trafficked road, with emissions that could give rise to sufficiently high concentrations of pollutants (in particular nitrogen dioxide), that would cause unacceptably high exposure for users of the new development; and*
- *the presence of a source of odour and/or dust that may affect amenity for future occupants of the development”.*

### ***Impacts of the Development on the Local Area***

A2.7 The guidance sets out two stages of screening criteria that can be used to identify whether a detailed air quality assessment is required, in terms of the impact of the development on the local area. The first stage is that you should proceed to the second stage if any of the following apply:

- 10 or more residential units or a site area of more than 0.5 ha residential use; and/or
- more than 1,000 m<sup>2</sup> of floor space for all other uses or a site area greater than 1 ha.

A2.8 Coupled with any of the following:

- the development has more than 10 parking spaces; and/or
- the development will have a centralised energy facility or other centralised combustion process.

A2.9 If the above do not apply then the development can be screened out as not requiring a detailed air quality assessment of the impact of the development on the local area. If they do apply then you proceed to stage 2, which sets out indicative criteria for requiring an air quality assessment. The stage 2 criteria relating to vehicle emissions are set out below:

- the development will lead to a change in LDV flows of more than 100 AADT within or adjacent to an AQMA or more than 500 AADT elsewhere;

- the development will lead to a change in HDV flows of more than 25 AADT within or adjacent to an AQMA or more than 100 AADT elsewhere;
- the development will lead to a realigning of roads (i.e. changing the proximity of receptors to traffic lanes) where the change is 5m or more and the road is within an AQMA;
- the development will introduce a new junction or remove an existing junction near to relevant receptors, and the junction will cause traffic to significantly change vehicle acceleration/deceleration, e.g. traffic lights or roundabouts;
- the development will introduce or change a bus station where bus flows will change by more than 25 AADT within or adjacent to an AQMA or more than 100 AADT elsewhere; and
- the development will have an underground car park with more than 100 movements per day (total in and out) with an extraction system that exhausts within 20 m of a relevant receptor.

A2.10 The criteria are more stringent where the traffic impacts may arise on roads where concentrations are close to the objective. The presence of an AQMA is taken to indicate the possibility of being close to the objective, but where whole authority AQMAs are present and it is known that the affected roads have concentrations below 90% of the objective, the less stringent criteria are likely to be more appropriate.

A2.11 On combustion processes (including standby emergency generators and shipping) where there is a risk of impacts at relevant receptors, the guidance states that:

*“Typically, any combustion plant where the single or combined NO<sub>x</sub> emission rate is less than 5 mg/sec is unlikely to give rise to impacts, provided that the emissions are released from a vent or stack in a location and at a height that provides adequate dispersion. As a guide, the 5 mg/s criterion equates to a 450 kW ultra-low NO<sub>x</sub> gas boiler or a 30kW CHP unit operating at <95mg/Nm<sup>3</sup>.*

*In situations where the emissions are released close to buildings with relevant receptors, or where the dispersion of the plume may be adversely affected by the size and/or height of adjacent buildings (including situations where the stack height is lower than the receptor) then consideration will need to be given to potential impacts at much lower emission rates.*

*Conversely, where existing nitrogen dioxide concentrations are low, and where the dispersion conditions are favourable, a much higher emission rate may be acceptable”.*

A2.12 Should none of the above apply then the development can be screened out as not requiring a detailed air quality assessment of the impact of the development on the local area, provided that professional judgement is applied; the guidance importantly states the following:

*“The criteria provided are precautionary and should be treated as indicative. They are intended to function as a sensitive ‘trigger’ for initiating an assessment in cases where there is a possibility of significant effects arising on local air quality. This possibility will, self-evidently, not be realised in many cases. The criteria should not be applied rigidly; in some instances, it may be appropriate to amend them on the basis of professional judgement, bearing in mind that the objective is to identify situations where there is a possibility of a significant effect on local air quality”.*

- A2.13 Even if a development cannot be screened out, the guidance is clear that a detailed assessment is not necessarily required:

*“The use of a Simple Assessment may be appropriate, where it will clearly suffice for the purposes of reaching a conclusion on the significance of effects on local air quality. The principle underlying this guidance is that any assessment should provide enough evidence that will lead to a sound conclusion on the presence, or otherwise, of a significant effect on local air quality. A Simple Assessment will be appropriate, if it can provide this evidence. Similarly, it may be possible to conduct a quantitative assessment that does not require the use of a dispersion model run on a computer”.*

- A2.14 The guidance also outlines what the content of the air quality assessment should include, and this has been adhered to in the production of this chapter.

### **Impact Descriptors and Assessment of Significance**

- A2.15 There is no official guidance in the UK in relation to development control on how to describe the nature of air quality impacts, nor how to assess their significance. The approach within the EPUK/IAQM guidance has, therefore, been used in this assessment. This approach involves a two stage process:

- a qualitative or quantitative description of the impacts on local air quality arising from the development; and
- a judgement on the overall significance of the effects of any impacts.

#### ***Impact Descriptors***

- A2.16 Impact description involves expressing the magnitude of incremental change as a proportion of a relevant assessment level and then examining this change in the context of the new total concentration and its relationship with the assessment criterion. Table A2.1 sets out the method for determining the impact descriptor for annual mean concentrations at individual receptors, having been adapted from the table presented in the guidance document. For the assessment criterion the term Air Quality Assessment Level or AQAL has been adopted, as it covers all pollutants, i.e. those with and without formal standards. Typically, as is the case for this

assessment, the AQAL will be the air quality objective value. Note that impacts may be adverse or beneficial, depending on whether the change in concentration is positive or negative.

**Table A2.1: Air Quality Impact Descriptors for Individual Receptors for All Pollutants <sup>a</sup>**

| Long-Term Average Concentration At Receptor In Assessment Year <sup>b</sup> | Change in concentration relative to AQAL <sup>c</sup> |            |             |             |             |
|-----------------------------------------------------------------------------|-------------------------------------------------------|------------|-------------|-------------|-------------|
|                                                                             | 0%                                                    | 1%         | 2-5%        | 6-10%       | >10%        |
| 75% or less of AQAL                                                         | Negligible                                            | Negligible | Negligible  | Slight      | Moderate    |
| 76-94% of AQAL                                                              | Negligible                                            | Negligible | Slight      | Moderate    | Moderate    |
| 95-102% of AQAL                                                             | Negligible                                            | Slight     | Moderate    | Moderate    | Substantial |
| 103-109% of AQAL                                                            | Negligible                                            | Moderate   | Moderate    | Substantial | Substantial |
| 110% or more of AQAL                                                        | Negligible                                            | Moderate   | Substantial | Substantial | Substantial |

<sup>a</sup> Values are rounded to the nearest whole number.

<sup>b</sup> This is the "Without Scheme" concentration where there is a decrease in pollutant concentration and the "With Scheme" concentration where there is an increase.

<sup>c</sup> AQAL = Air Quality Assessment Level, which may be an air quality objective, EU limit or target value, or an Environment Agency 'Environmental Assessment Level (EAL)'.

### ***Assessment of Significance***

A2.17 The guidance recommends that the assessment of significance should be based on professional judgement, with the overall air quality impact of the development described as either 'significant' or 'not significant'. In drawing this conclusion, the following factors should be taken into account:

- the existing and future air quality in the absence of the development;
- the extent of current and future population exposure to the impacts;
- the influence and validity of any assumptions adopted when undertaking the prediction of impacts;
- the potential for cumulative impacts and, in such circumstances, several impacts that are described as '*slight*' individually could, taken together, be regarded as having a significant effect for the purposes of air quality management in an area, especially where it is proving difficult to reduce concentrations of a pollutant. Conversely, a '*moderate*' or '*substantial*' impact may not have a significant effect if it is confined to a very small area and where it is not obviously the cause of harm to human health; and
- the judgement on significance relates to the consequences of the impacts; will they have an effect on human health that could be considered as significant? In the majority of cases, the impacts from an individual development will be insufficiently large to result in measurable changes in health outcomes that could be regarded as significant by health care professionals.

- A2.18 The guidance is clear that other factors may be relevant in individual cases. It also states that the effect on the residents of any new development where the air quality is such that an air quality objective is not met will be judged as significant. For people working at new developments in this situation, the same will not be true as occupational exposure standards are different, although any assessment may wish to draw attention to the undesirability of the exposure.
- A2.19 A judgement of the significance should be made by a competent professional who is suitably qualified. A summary of the professional experience of the staff contributing to this assessment is provided in the ES Chapter.

## A3 Modelling Methodology

### Model Inputs

- A3.1 Predictions have been carried out using the ADMS-Roads dispersion model (v4.1). The model requires the user to provide various input data, including emissions from each section of road and the road characteristics, such as road width. Vehicle emissions have been calculated based on vehicle flow, composition and speed data using the EFT (Version 8.0.1) published by Defra<sup>4</sup>.
- A3.2 Hourly sequential meteorological data from East Midlands Airport for 2018 have been used in the model. The meteorological monitoring station is located approximately 13 km to the southeast of the proposed development site. It is deemed to be the nearest monitoring station representative of meteorological conditions in the vicinity of the proposed development site; both the development site and the East Midlands Airport meteorological monitoring station are located in the Midlands where they will be influenced by the effects of inland meteorology.
- A3.3 AADT flows, speeds and vehicle fleet composition data have been provided by RPS Group, who have undertaken the transport assessment work for the proposed development. The traffic data used in this assessment are summarised in Table A3.1. Diurnal and monthly flow profiles for the traffic have been derived from the national profiles published by DfT<sup>5</sup>.

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<sup>4</sup> Defra (2019), *Local Air Quality Management (LAQM) Support Website*, Available: <http://laqm.defra.gov.uk/>.

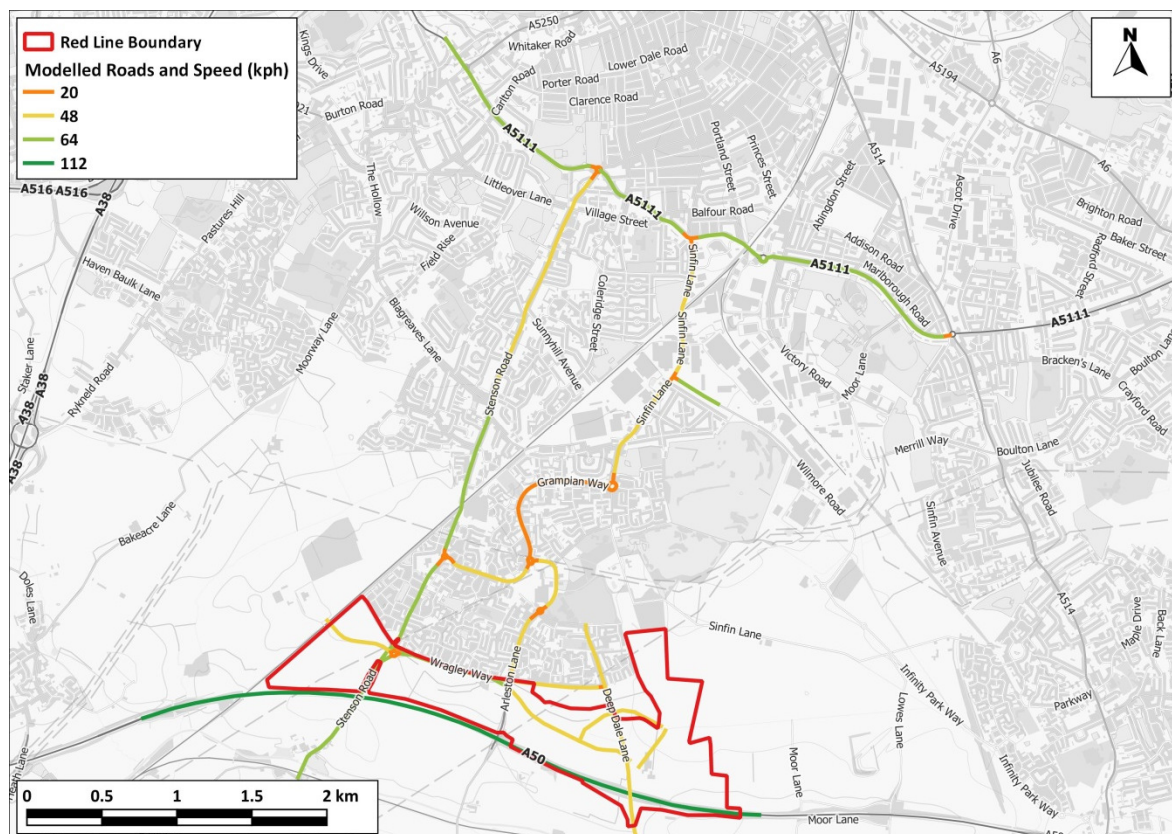
<sup>5</sup> DfT (2017b) *DfT Automatic traffic Counters Table TRA0305-0307*, Available: <https://www.gov.uk/government/statistical-data-sets/tra03-motor-vehicle-flow>.

**Table A3.1: Summary of Traffic Data used in the Assessment (AADT Flows) <sup>a</sup>**

| Road Link                               | 2018          |             | 2025 (Without Scheme) |             | 2025 (With Scheme) |             |
|-----------------------------------------|---------------|-------------|-----------------------|-------------|--------------------|-------------|
|                                         | AADT          | %HDV        | AADT                  | %HDV        | AADT               | %HDV        |
| Deep Dale Lane (South of Wragley Way)   | 4,120         | 0.2         | 4,749                 | 0.2         | 4,981              | 0.2         |
| Deep Dale Lane (North of Wragley Way)   | 4,205         | 0.0         | 4,847                 | 0.0         | 4,775              | 0.0         |
| Wragley Way (West of Deep Dale Lane)    | 5,104         | 0.7         | 5,893                 | 0.7         | 2,827              | 3.7         |
| Arleston Lane                           | 4,500         | 2.0         | 5,188                 | 2.0         | 8,734              | 1.2         |
| Wragley Way (West of Arleston Lane)     | 4,436         | 2.0         | 5,114                 | 2.0         | 21,229             | 0.5         |
| Stenson Road (South of Wragley Way)     | 7,770         | 0.2         | 8,956                 | 0.2         | 10,163             | 0.2         |
| Stenson Road (North of Wragley Way)     | 8,466         | 1.2         | 9,759                 | 1.2         | 31,281             | 0.4         |
| Grampian Way (East of Stenson Road)     | 16,870        | 0.7         | 19,445                | 0.7         | 22,734             | 0.6         |
| Stenson Road (North of Grampian Way)    | 16,124        | 0.6         | 18,587                | 0.6         | 29,957             | 0.4         |
| Grampian Way (West of Sinfin Lane)      | 17,538        | 2.1         | 20,216                | 2.1         | 30,012             | 1.4         |
| Sinfin Lane (North of Grampian Way)     | 18,174        | 0.8         | 20,949                | 0.8         | 29,021             | 0.5         |
| Wilmore Road                            | 16,230        | 2.3         | 18,708                | 2.3         | 20,850             | 2.1         |
| Sinfin Lane (North of Wilmore Road)     | 29,555        | 4.1         | 34,068                | 4.1         | 27,361             | 5.0         |
| Stenson Road (North of Blagreaves Lane) | 26,233        | 3.4         | 30,667                | 3.0         | 40,657             | 2.6         |
| Warwick Avenue                          | 32,007        | 2.6         | 36,894                | 2.6         | 41,336             | 2.3         |
| Kenilworth Avenue                       | 26,233        | 3.4         | 30,239                | 3.4         | 32,767             | 3.1         |
| Osmaston Park Road                      | 28,250        | 3.6         | 32,563                | 3.6         | 35,220             | 3.3         |
| Link Road (East of Arleston Lane)       | 0             | 0.0         | 0                     | 0.0         | 20,941             | 10.0        |
| Link Road (West of Deep Dale Lane)      | 0             | 0.0         | 0                     | 0.0         | 3,910              | 10.0        |
| Link Road (East of Deep Dale Lane)      | 0             | 0.0         | 0                     | 0.0         | 9,036              | 10.0        |
| Link Road East (North of A50)           | 0             | 0.0         | 0                     | 0.0         | 32,551             | 20.0        |
| Link Road West (North of A50)           | 0             | 0.0         | 0                     | 0.0         | 18,494             | 10.0        |
| Link Road (West of Stenson Road)        | 0             | 0.0         | 0                     | 0.0         | 3,945              | 10.0        |
| <b>A50</b>                              | <b>50,403</b> | <b>16.1</b> | <b>57,816</b>         | <b>19.3</b> | <b>59,114</b>      | <b>16.3</b> |

<sup>a</sup> 2030 traffic flows have been used for the assessment of impacts in 2025

A3.4 Figure A3.1 shows the road network included within the model, along with the speed at which each link was modelled.



**Figure A3.1: Modelled Road Network & Speed**

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### ***Sensitivity Test for Nitrogen Oxides and Nitrogen Dioxide***

A3.5 As explained in Section K3 of Volume 2, Chapter K, AQC has carried out a detailed analysis which showed that, whereas previous standards had had limited on-road success in reducing nitrogen oxides emissions from diesel vehicles, the 'Euro VI' and 'Euro 6' standards are delivering real on-road improvements<sup>6</sup>. Defra's EFT v8.0.1 takes account of these observed improvements, but also makes additional assumptions regarding the performance of diesel cars and vans that will be produced in the future. In particular, it assumes that diesel cars and vans registered for type approval after 2020 will, on average, emit significantly less NO<sub>x</sub> than earlier models. A sensitivity test has been carried out using AQC's CURED v3A model<sup>7</sup>, which assumes that this post-2020

<sup>6</sup> AQC (2016) *Emissions of Nitrogen Oxides from Modern Diesel Vehicles*, Available: <http://www.aqconsultants.co.uk/getattachment/Resources/Download-Reports/Emissions-of-Nitrogen-Oxides-from-Modern-Diesel-Vehicles-210116.pdf.aspx>.

<sup>7</sup> AQC (2017) *CURED v3A*, Available: <http://www.aqconsultants.co.uk/Resources/Download-Reports.aspx>.

technology does not deliver any benefits (as a worst-case assumption). Further details of CURED v3A are provided in the supporting report prepared by AQC<sup>8</sup>.

## Background Concentrations

- A3.6 The background pollutant concentrations across the study area have been defined using the national pollution maps published by Defra<sup>4</sup>. These cover the whole of the UK on a 1x1 km grid and are published for each year from 2015 until 2030. The background annual mean nitrogen dioxide maps for 2018 have been calibrated against concurrent measurements from national monitoring sites<sup>9</sup>. The calibration factor calculated has also been applied to future year backgrounds. This has resulted in slightly higher predicted nitrogen dioxide concentrations for the future assessment year than those derived from the Defra maps.

### *Background NO<sub>2</sub> Concentrations for Sensitivity Test*

- A3.7 The road-traffic components of nitrogen dioxide in the background maps have been uplifted in order to derive future year background nitrogen dioxide concentrations for use in the sensitivity test. Details of the approach are provided in the report prepared by AQC<sup>10</sup>.

## Model Verification

- A3.8 In order to ensure that ADMS-Roads accurately predicts local concentrations, it is necessary to verify the model against local measurements.

### *Background Concentrations*

- A3.9 The 2018 background concentrations for the monitoring sites have been derived from the national maps, having been calculated using the same approach as described in Paragraph A3.6, and are presented in Table A3.2.

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<sup>8</sup> AQC (2018) *Development of the CURED v3A Emissions Model*, Available: <http://www.aqconsultants.co.uk/Resources/Download-Reports.aspx>.

<sup>9</sup> AQC (2018) *Calibrating Defra's 2015-based Background NO<sub>x</sub> and NO<sub>2</sub> Maps against 2016 and 2017 Measurements*, Available: <http://www.aqconsultants.co.uk/AQC/media/Reports/Background-Calibration-News-F2.pdf>.

<sup>10</sup> AQC (2018) *Adjusting Background NO<sub>2</sub> Maps for CURED v3A*, Available: <http://www.aqconsultants.co.uk/Resources/Download-Reports.aspx>.

**Table A3.2: Background Concentrations used in the Verification for 2018**

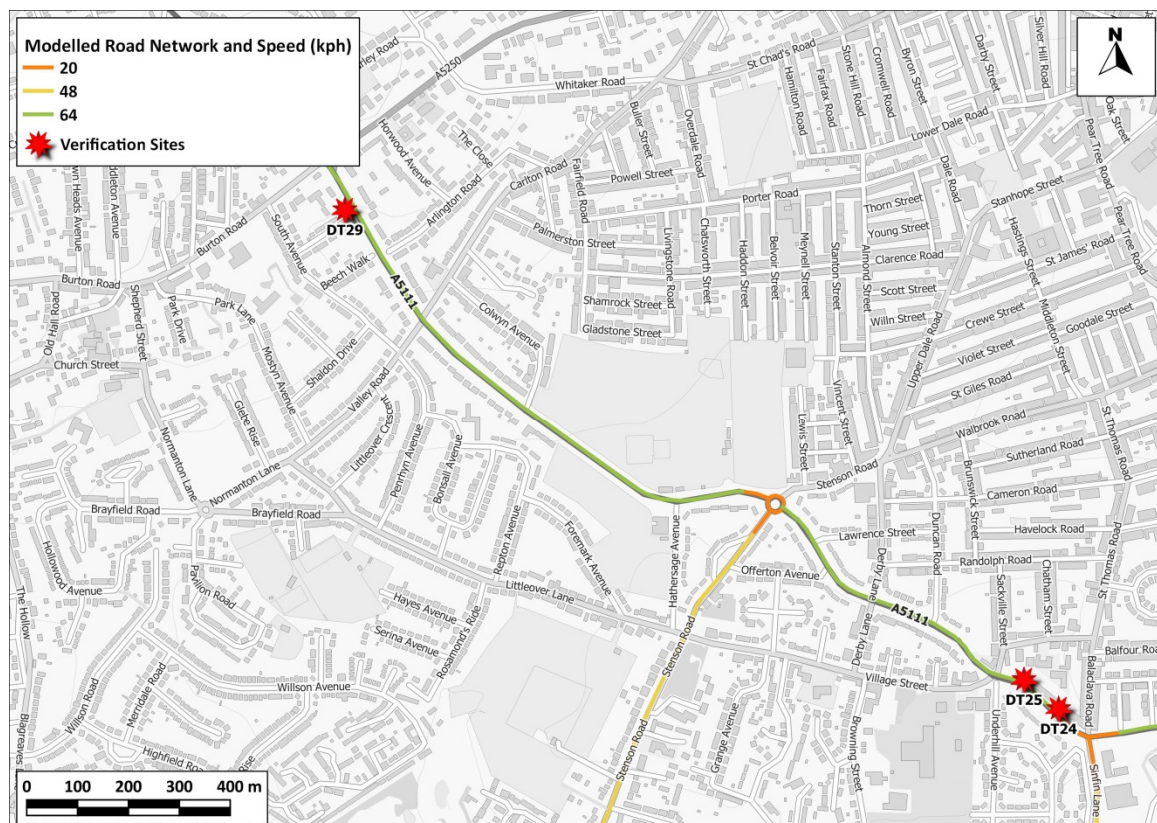
| Site          | NO <sub>2</sub> |
|---------------|-----------------|
| DT 24 / DT 25 | 21.7            |
| DT 29         | 17.7            |
| Objectives    | 40              |

***Traffic Data***

A3.10 Baseline AADT flows, speeds and the proportions of HDVs, for the roads adjacent to the monitoring sites, have been provided by RPS Group. Traffic data used in the model verification are summarised in Table A3.3, and presented in Figure A3.2.

**Table A3.3: 2018 AADT Traffic Data used in the Model Verification**

| Road Link                    | AADT   | %HDV |
|------------------------------|--------|------|
| A5111 (West of Stenson Road) | 32,007 | 2.6  |
| A5111 (East of Stenson Road) | 26,233 | 3.4  |
| Sinfin Lane                  | 29,555 | 4.1  |
| A5111 (East of Sinfin Lane)  | 28,250 | 3.6  |



**Figure A3.2: Modelled Road Network & Speed**

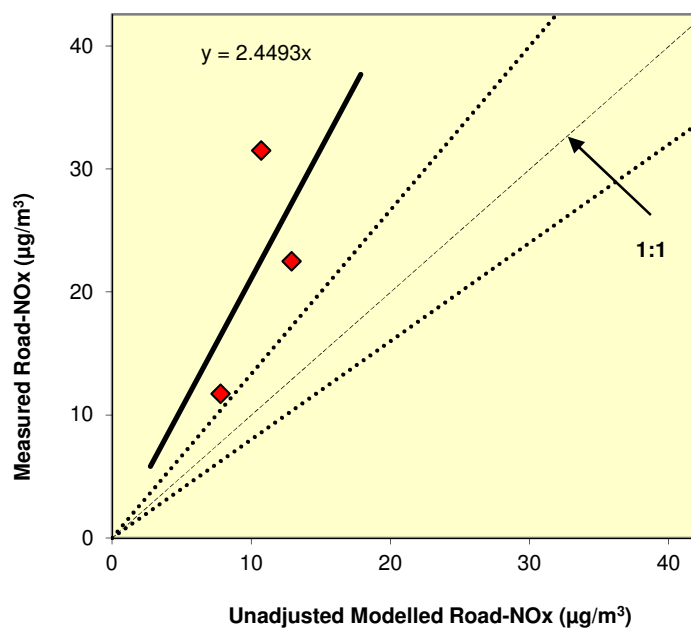
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### ***Nitrogen Dioxide***

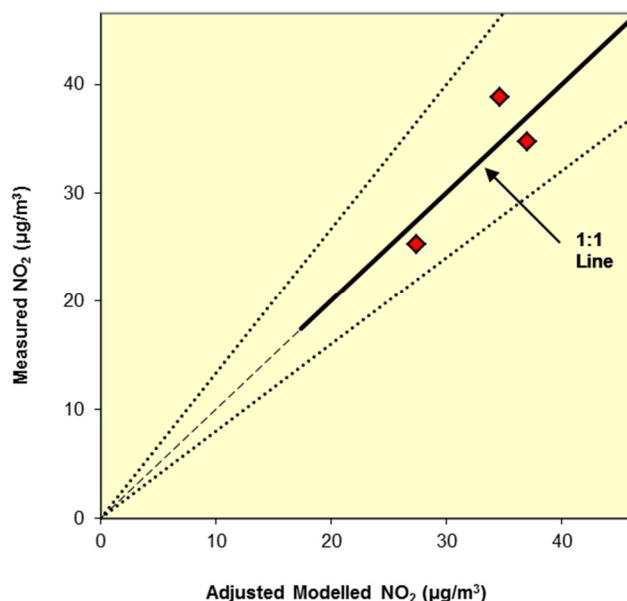
- A3.11 Most nitrogen dioxide ( $\text{NO}_2$ ) is produced in the atmosphere by reaction of nitric oxide ( $\text{NO}$ ) with ozone. It is therefore most appropriate to verify the model in terms of primary pollutant emissions of nitrogen oxides ( $\text{NO}_x = \text{NO} + \text{NO}_2$ ). The model has been run to predict the annual mean  $\text{NO}_x$  concentrations during 2018 at three diffusion tube monitoring sites (DT 24, DT25 and DT29) on the A5111. Concentrations have been modelled at 1.8 m, the height of the monitors as detailed in the Council's ASR.
- A3.12 The model output of road- $\text{NO}_x$  (i.e. the component of total  $\text{NO}_x$  coming from road traffic) has been compared with the 'measured' road- $\text{NO}_x$ . Measured road- $\text{NO}_x$  has been calculated from the measured  $\text{NO}_2$  concentrations and the predicted background  $\text{NO}_2$  concentration using the  $\text{NO}_x$  from  $\text{NO}_2$  calculator (Version 6.1) available on the Defra LAQM Support website<sup>4</sup>.
- A3.13 An adjustment factor has been determined as the slope of the best-fit line between the 'measured' road contribution and the model derived road contribution, forced through zero (Figure A3.3).

The calculated adjustment factor of 2.449 has been applied to the modelled road-NO<sub>x</sub> concentration for each receptor to provide adjusted modelled road-NO<sub>x</sub> concentrations.

- A3.14 The total nitrogen dioxide concentrations have then been determined by combining the adjusted modelled road-NO<sub>x</sub> concentrations with the predicted background NO<sub>2</sub> concentration within the NO<sub>x</sub> to NO<sub>2</sub> calculator. Figure A3.4 compares final adjusted modelled total NO<sub>2</sub> at each of the monitoring sites to measured total NO<sub>2</sub>, and shows a close agreement.
- A3.15 The results imply that the model has under predicted the road-NO<sub>x</sub> contribution. This is a common experience with this and most other road traffic emissions dispersion models.



**Figure A3.3: Comparison of Measured Road NO<sub>x</sub> to Unadjusted Modelled Road NO<sub>x</sub> Concentrations. The dashed lines show  $\pm 25\%$ .**



**Figure A3.4: Comparison of Measured Total NO<sub>2</sub> to Final Adjusted Modelled Total NO<sub>2</sub> Concentrations. The dashed lines show  $\pm 25\%$ .**

### ***PM<sub>10</sub> and PM<sub>2.5</sub>***

A3.16 There are no nearby PM<sub>10</sub> or PM<sub>2.5</sub> monitors. It has therefore not been possible to verify the model for PM<sub>10</sub> or PM<sub>2.5</sub>. The model outputs of road-PM<sub>10</sub> and road-PM<sub>2.5</sub> have therefore been adjusted by applying the adjustment factor calculated for road NO<sub>x</sub>.

### **Model Post-processing**

A3.17 The model predicts road-NO<sub>x</sub> concentrations at each receptor location. These concentrations have been adjusted using the adjustment factor set out above, which, along with the background NO<sub>2</sub>, has been processed through the NO<sub>x</sub> to NO<sub>2</sub> calculator available on the Defra LAQM Support website<sup>4</sup>. The traffic mix within the calculator has been set to "All other urban UK traffic", which is considered suitable for the study area. The calculator predicts the component of NO<sub>2</sub> based on the adjusted road-NO<sub>x</sub> and the background NO<sub>2</sub>.

## A4 Construction Mitigation

A4.1 The following is a set of best-practice measures from the IAQM guidance<sup>1</sup> that should be incorporated into the specification for the works. These measures should ideally be written into a Dust Management Plan. Some of the measures may only be necessary during specific phases of work, or during activities with a high potential to produce dust, and the list should be refined and expanded upon in liaison with the construction contractor when producing the Dust Management Plan

### Communications

- develop and implement a stakeholder communications plan that includes community engagement before and during work on site;
- display the name and contact details of person(s) accountable for air quality and dust issues on the site boundary. This may be the environmental manager/engineer or the site manager; and
- display the head or regional office contact information.

### Dust Management Plan

- Develop and implement a Dust Management Plan (DMP) approved by the Local Authority which documents the mitigation measures to be applied, and the procedures for their implementation and management.

### Site Management

- Record all dust and air quality complaints, identify cause(s), take appropriate measures to reduce emissions in a timely manner, and record the measures taken;
- make the complaints log available to the local authority when asked;
- record any exceptional incidents that cause dust and/or air emissions, either on- or off-site, and the action taken to resolve the situation in the log book; and
- hold regular liaison meetings with other high risk construction sites within 500 m of the site boundary, to ensure plans are co-ordinated and dust and particulate matter emissions are minimised. It is important to understand the interactions of the off-site transport/deliveries which might be using the same strategic road network routes.

### Monitoring

- Undertake daily on-site and off-site inspections where receptors (including roads) are nearby, to monitor dust. Record inspection results, and make the log available to the

Local Authority when asked. This should include regular dust soiling checks of surfaces such as street furniture, cars and window sills within 100 m of the site boundary, with cleaning to be provided if necessary;

- carry out regular site inspections to monitor compliance with the DMP, record inspection results, and make an inspection log available to the Local Authority when asked;
- increase the frequency of site inspections by the person accountable for air quality and dust issues on site when activities with a high potential to produce dust are being carried out and during prolonged dry or windy conditions; and
- agree dust deposition, dust flux, or real-time PM<sub>10</sub> continuous monitoring locations with the Local Authority. Where possible commence baseline monitoring at least three months before work commences on site or, if it is a large site, before work on a phase commences. Further guidance is provided by IAQM on monitoring during demolition, earthworks and construction<sup>11</sup> (IAQM, 2012).

### **Preparing and Maintaining the Site**

- Plan the site layout so that machinery and dust-causing activities are located away from receptors, as far as is possible;
- erect solid screens or barriers around dusty activities or the site boundary that are at least as high as any stockpiles on site;
- fully enclose site or specific operations where there is a high potential for dust production and the site is active for an extensive period;
- avoid site runoff of water or mud;
- keep site fencing, barriers and scaffolding clean using wet methods;
- remove materials that have a potential to produce dust from site as soon as possible, unless being re-used on site. If they are being re-used on-site cover as described below; and
- cover, seed, or fence stockpiles to prevent wind whipping.

### **Operating Vehicle/Machinery and Sustainable Travel**

- Ensure all vehicles switch off their engines when stationary – no idling vehicles;
- avoid the use of diesel- or petrol-powered generators and use mains electricity or battery-powered equipment where practicable;

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<sup>11</sup> IAQM (2012) Guidance on Air Quality Monitoring in the Vicinity of Demolition and Construction Sites, Available: [www.iaqm.co.uk/guidance.html](http://www.iaqm.co.uk/guidance.html).

- impose and signpost a maximum-speed-limit of 15 mph on surfaced and 10 mph on un-surfaced haul roads and work areas (if long haul routes are required these speeds may be increased with suitable additional control measures provided, subject to the approval of the nominated undertaker and with the agreement of the local authority, where appropriate);
- produce a Construction Logistics Plan to manage the sustainable delivery of goods and materials; and
- implement a Travel Plan that supports and encourages sustainable staff travel (public transport, cycling, walking, and car-sharing).

## Operations

- Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction, e.g. suitable local exhaust ventilation systems;
- ensure an adequate water supply on the site for effective dust/particulate matter suppression/mitigation, using non-potable water where possible and appropriate;
- use enclosed chutes, conveyors and covered skips;
- minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate; and
- ensure equipment is readily available on site to clean any dry spillages, and clean up spillages as soon as reasonably practicable after the event using wet cleaning methods.

## Waste Management

- Avoid bonfires and burning of waste materials.

## Measures Specific to Earthworks

- Re-vegetate earthworks and exposed areas/soil stockpiles to stabilise surfaces as soon as practicable;
- use Hessian, mulches or trackifiers where it is not possible to re-vegetate or cover with topsoil, as soon as practicable; and
- only remove the cover from small areas during work, not all at once.

## Measures Specific to Construction

- Avoid scabbling (roughening of concrete surfaces), if possible;

- ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out, unless this is required for a particular process, in which case ensure that appropriate additional control measures are in place;
- ensure bulk cement and other fine powder materials are delivered in enclosed tankers and stored in silos with suitable emission control systems to prevent escape of material and overfilling during delivery; and
- for smaller supplies of fine powder materials ensure bags are sealed after use and stored appropriately to prevent dust.

### **Measures Specific to Trackout**

- Use water-assisted dust sweeper(s) on the access and local roads, to remove, as necessary, any material tracked out of the site. This may require the sweeper being continuously in use;
- avoid dry sweeping of large areas; and
- ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport.