

6.2 Mitigation

Mitigation During Construction

- 16.1 The IAQM dust guidance lists mitigation measures for low, medium and high dust risks.
- 16.2 As summarised in Chapter 6: Air Quality, the predicted Dust Impact Risk is classified as low for Earthworks, and medium for Construction and Trackout. The general site measures described as 'highly recommended' for medium risks are listed below. The 'highly recommended' measures for medium risk construction and trackout are also listed. There are no 'highly recommended' measures for low risk earthworks.

Communications
<ul style="list-style-type: none"> Develop and implement a stakeholder communications plan that includes community engagement before work commences 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 environment manager/engineer or the site manager. Display the head or regional office contact information.
Dust Management Plan
<ul style="list-style-type: none"> Develop and implement a Dust Management Plan (DMP) (which may include measures to control other emissions), approved by the Local Authority. The level of detail will depend on the risk, and should include as a minimum the highly recommended measures in this document. The desirable measures should be included as appropriate for the site. The DMP may include monitoring of dust deposition, dust flux, real-time PM₁₀ continuous monitoring and/or visual inspections.
Site Management
<ul style="list-style-type: none"> 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.
Monitoring
<ul style="list-style-type: none"> 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. Agree dust deposition, dust flux, or real-time PM₁₀ continuous monitoring locations with the Local Authority. Commence baseline monitoring at least three months before work commences on site or, if it a large site, before work on a phase commences. A shorter monitoring period or concurrent upwind and downwind monitoring may be agreed by the local authority. Further guidance is provided by IAQM on monitoring during demolition, earthworks and construction [1].
Preparing and maintaining the site

<ul style="list-style-type: none"> Plan 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 extended 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. Cover, seed or fence stockpiles to prevent wind whipping.
Operating vehicle/machinery and sustainable travel
<ul style="list-style-type: none"> Ensure all vehicles switch off 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. Produce a Construction Logistics Plan to manage the sustainable delivery of goods and materials.
Operations
<ul style="list-style-type: none"> 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 and 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. 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
<ul style="list-style-type: none"> Avoid bonfires and burning of waste materials.
Medium risk measures specific to construction
<ul style="list-style-type: none"> 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.
Medium risk measures specific to trackout
<ul style="list-style-type: none"> 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. Ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport. Inspect on-site haul routes for integrity and instigate necessary repairs to the surface as soon as reasonably practicable. Record all inspections of haul routes and any subsequent action in a site log book. Install hard surfaced haul routes, which are regularly damped down with fixed or mobile sprinkler systems, or mobile water bowsers and regularly cleaned.

- Implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site where reasonably practicable).
- Ensure there is an adequate area of hard surfaced road between the wheel wash facility and the site exit, wherever site size and layout permits.
- Access gates to be located at least 10m from receptors where possible.

- 16.3 The IAQM dust guidance states that with the recommended dust mitigation measures in place the residual effect will normally be “*not significant*”, and recommends the mitigation is secured by for example planning conditions, a legal obligation, or by legislation.

Mitigation for New Population Exposure (Site Suitability)

- 16.4 The First Street site is within an existing AQMA. The predicted pollutant concentrations are below the relevant AQS objectives for all pollutants at all receptors proposed for the Proposed Development on the fourth floor and above; but above the annual-mean NO₂ AQS objective of 40 µg.m⁻³ at several receptors proposed for the ground, first, second, and third-floor levels. Consequently, mitigation is required at all residential homes on the first-floor and at certain homes on the second and third-floor level of the Proposed Development to protect sensitive (residential) receptors from exposure to poor air quality (there are no receptors on the ground floor where the annual-mean AQS objective applies).
- 16.5 The National Planning Policy Framework gives no specific detail on air quality mitigation for general development purposes. The national Planning Practice Guidance limits itself to some high-level general advice on air quality mitigation and notes “*Mitigation options where necessary will be locationally specific, will depend on the proposed development and should be proportionate to the likely impact. It is important therefore that local planning authorities work with applicants to consider appropriate mitigation so as to ensure the new development is appropriate for its location and unacceptable risks are prevented. Planning conditions and obligations can be used to secure mitigation where the relevant tests are met.*”
- 16.6 Although, the NPPG lists some examples, it provides no guidance whatsoever on how the most appropriate mitigation options should be chosen for a given application, or on the efficacy of the different mitigation options.
- 16.7 The Institute of Air Quality Management (IAQM) Position Statement on mitigation of air quality impacts [2] states that the IAQM position is that the appropriate mitigation solution for any given general development scheme should be principle-led rather than specified by detailed prescription and recommends the use of a hierarchy (drawn from similar well-established mitigation hierarchies used for EIA development [3] and for

dealing with pollution exposure in workplace/occupational situations [4] [5] as the starting point for mitigating impacts. This hierarchy, shown below in [Table 6.2.1](#), is suitable both for impacts caused by a potentially polluting new development, and for the impact of exposure on new occupants of a development proposed in an area of existing poor air quality.

Table 6.2.1 IAQM mitigation Hierarchy for General Development Schemes

I.	Preference should be given to preventing or avoiding exposure/impacts to the pollutant in the first place by eliminating or isolating potential sources or by replacing sources or activities with alternatives. This is usually best achieved through taking air quality considerations into account at the development scheme design stage.
II.	<p>Reduction and minimisation of exposure/impacts should next be considered, once all options for prevention/avoidance have been implemented so far as is reasonably practicable (both technically and economically). To achieve this reduction/minimisation, preference should be given first to:</p> <ul style="list-style-type: none"> a. mitigation measures that act on the source; before b. mitigation measures that act on the pathway; which in turn should take preference over c. mitigation measures at or close to the point of receptor exposure <p>all subject to the efficacy, cost and practicability of the available solutions. In each case, measures that are designed or engineered to operate passively are preferred to active measures that require continual intervention, management or a change in people`s behaviours.</p>
III.	Off-setting a new development`s air quality impact by proportionately contributing to air quality improvements elsewhere (including those identified in air quality action plans and low emission strategies) should only be considered once the solutions for preventing/avoiding, and then for reducing/minimising, impacts have been exhausted.

16.8 As well as the examples of mitigation measures listed in the Air Quality section of the NPPG, specific examples are also provided in the London SPG "*Sustainable Design and Construction*" (GLA, 2014), the EPUK guidance "Development Control: Planning for Air Quality (2010 Update)", and Defra`s "*Low Emissions Strategies using the planning system to reduce transport emissions, Good Practice Guidance*" (2010). [Table 6.2.2](#) below summarises how these mitigation options are aligned with the IAQM hierarchy.

Table 6.2.2 Good Practice Examples of Mitigation Aligned with the IAQM Hierarchy

IAQM Indicative Mitigation Hierarchy			Cited Examples	Ref	Impact on	Site suitability
I. Preventing or avoiding exposure/impacts to the pollutant in the first place by eliminating or isolating potential sources or by replacing sources or activities with alternatives			Making a potentially-polluting development a car-free scheme (and free from other vehicles if relevant).		x	
			Making a potentially-polluting development a zero-emissions car/vehicle-only scheme.		x	
II. Reduction and minimisation of exposure/impacts	Mitigation measures that act on the <u>source</u>	Measures that are designed or engineered to operate passively without continual intervention	Limiting number of parking place provided for the new development.	3	x	
			Preferential parking for low emission or car club vehicles or graduated parking charges based on emissions	3, 4	x	
			Provision of low vehicle emission infrastructure (e.g. electric vehicle charging bays, low emissions fuelling points).	1, 3, 4	x	
			Agreement to achieve specified emissions standards for service vehicles for the development.	3	x	
		Active measures that require continual intervention, management or change in people's behaviours	Promoting and putting a car club in place at the development (to reduce absolute use and/or to give access to low-emissions vehicles e.g. electric cars)	1, 3, 4	x	
			Development and promotion of cycle-rental schemes.	1, 4	x	
			Travel plans	3	x	
	Mitigation measures that act on the <u>pathway</u>	Passive measures	Scheme amended to increase the set-back distance of sensitive-use buildings from sources of pollution (e.g. a busy road).	1, 2, 3		X
			Changes to building orientation and/or internal layout to increase effective separation distances of "habitable rooms" from air pollution sources (e.g. busy road) by placing corridors, stairwells, bathrooms, utility rooms, cellars, etc on the worst affected façade. Similarly, consider less-sensitive uses for the lower floor(s).	1, 2, 3		X
			For mechanically-ventilated buildings, locating air-intakes away from the main source of air pollution.	1, 2, 3		X
			Changes to scheme design to avoid creating a street canyon and trapping pollutants at receptors.	3	x	X
			Installation of bunds or barriers that interrupt the transport of polluted air to receptors.		x	X
			Installing green infrastructure (e.g. trees) to filter air at locations between source and receptors (caution needed to ensure dispersion not compromised).	1	x	
		Active measures	None currently described in good practice guidance.			
	Mitigation measures at or close to the	Passive measures	Positioning, design and screening of outside spaces of sensitive-use buildings, e.g. gardens, balconies and roof terraces.	2		x

IAQM Indicative Mitigation Hierarchy		Cited Examples		Application		
				Ref	Impact on	Site suitability
	point of receptor exposure		Remove or re-locate balconies of sensitive-use buildings (may be best avoided in locations of poor air quality, especially at ground and first floors).	3		x
			Building designed without indoor combustion pollutant sources that would otherwise add to occupants` exposure. For example, fitted with electric cookers, electric water/space heaters, or centralised/ community water/space heating.			x
			For mechanically-ventilated buildings, fit filters for incoming air and maintain filters in accordance with European standard EN 13779.	2		x
			For naturally-ventilated sensitive-use buildings, consider mechanical ventilation.	1, 3		x
			Installing green infrastructure (e.g. certain trees, green planting/walls and screens) to filter air at receptor locations.	1, 2	x	x
			Installing NOx-eating coatings (e.g. on pavements) at receptor locations.		x	
		Active measures	Installing air-tight windows that can still be opened at the residents` discretion.	3		x
III. Off-setting a new development`s air quality impact by proportionately contributing to air quality improvements elsewhere			Contributing funding to measures, including those identified in air quality action plans and low emission strategies, designed to offset the impact on air quality arising from new development.	1	x	
			Working with the relevant planning authority or nearby property owners to identify suitable NOx and PM abatement measures off-site in the vicinity of the development such as: green planting/walls and screens, with special consideration given to planting that absorbs or suppresses pollutants; upgrade or abatement work to combustion plant; retro-fitting abatement technology for vehicles and flues; and exposure reduction measures. Excludes air quality monitoring as is not considered an actual air quality mitigation measures.	2	x	
			Contribution (can be a financial one) to help the authority develop and implement its action plan. May be a contribution to the authority`s air quality monitoring programme.	3	x	
			Contribution to specific traffic management or road schemes	3	x	
			Contributions to local plans, related to the actual impact.	4	x	

Reference sources:

1 = NPPG, Air Quality section.

2 = London SPG "Sustainable Design and Construction", GLA, 2014.

3 = EPUK, Development Control: Planning for Air Quality (2010 Update).

4 = Defra, Low Emissions Strategies using the planning system to reduce transport emissions, Good Practice Guidance, 2010

- 16.9 The mitigation options shown in [Table 6.2.2](#) are practical, locationally-specific (i.e. excluding local area-wide emissions reduction schemes) examples of measures to deal with impacts that might be within the reasonable control of the developer to implement, depending on the scale and kind of development. The scale of mitigation should reflect the severity of the impact of exposure and the context of the development.
- 16.10 The issue of what is within the reasonable control of the developer often severely constrains the available and practicable mitigation options available to developers of schemes that won't themselves cause an impact but will be exposing new occupants to an area of poor existing air quality. In these circumstances where "site suitability" is the issue, the developer is not usually able to do much to eliminate or reduce the source of the pollution (usually general traffic in the area); options are limited to measures on the pathway (e.g. reconfiguring the scheme layout) or on the receptors (e.g. modifying the ventilation strategy).
- 16.11 For the Proposed Development, the following mitigation measures are recommended to reduce the exposure of future occupants to NO₂ and improve the suitability of the development for its proposed use:

Provision of air tight (hermetically sealed) windows for:

- All residential units (2 Studios, 7 Cluster Bedrooms) on the 1st Floor (Level 01),
- All Clusters Bedrooms (total 4) and the Studio closest to the Cluster Bedrooms on the west side + three Cluster Bedrooms closest to the Cluster Kitchen on the east side on the 2nd Floor; and
- The two Cluster Bedrooms closest to the Cluster Kitchen on the west side of the 3rd Floor.

The specification of the windows should not preclude the windows from being open, at the residents' discretion, to allow rapid ventilation; and

Provision of mechanical ventilation for:

- All residential units (2 Studios, 7 Cluster Bedrooms) on the 1st Floor (Level 01),
- All Clusters Bedrooms (total 4) and the Studio closest to the Cluster Bedrooms on the west side + three Cluster Bedrooms closest to the Cluster Kitchen on the east side on the 2nd Floor; and
- The two Cluster Bedrooms closest to the Cluster Kitchen on the west side of the 3rd Floor.

Ventilation air should be supplied from an intake point on the building as far away as practicable from the major pollution sources. The intake is commonly specified to be at roof level at the rear of the property. If possible, the intakes should be located at

Commented [BK1]: Are there any lounges that need to be included

an elevated point where the AQS objective is predicted to be achieved. If no such intake location is possible, then the intake should incorporate NO₂ filters to European Standard EN 13779. Further Government guidance [6] for mechanical ventilation provision in dwellings is provided below.

Table 6.2.3 Guidance on Ventilation Intake Placement for Minimising Ingress of Pollutants

Pollutant Source	Recommendation
<ul style="list-style-type: none"> Local static sources: Parking areas; Welding areas; Loading bays; Adjacent building exhausts; and Stack discharges 	<ul style="list-style-type: none"> Ventilation intakes need to be placed away from the direct impact of short-range pollution sources especially if the sources are within a few metres of the building. Some guidance is given in CIBSE TM21.
Urban traffic	<ul style="list-style-type: none"> Air intakes for buildings positioned directly adjacent to urban roads should be as high as possible and away from the direct influence of the source so as to minimise the ingress of traffic pollutants. There will be exceptions to this simple guide and these risks may need to be assessed by modelling. In such case it is recommended that expert advice is sought. For buildings located one or two streets away, the placement of intakes is less critical.
Building Features/Layout: Courtyards Street Canyons (i.e a canyon formed in a street between two rows of tall buildings).	<ul style="list-style-type: none"> Intakes should not be located in these spaces where there are air pollutant discharges. This included emission discharges from building ventilation system exhausts. If air intakes are to be located in these spaces, they should be positioned as far as possible from the source in an open or well-ventilated area. In addition, steps should be taken to reduce the polluted source, e.g parking and loading should be avoided as pollutants can accumulate in enclosed regions such as courtyards.
Multiple Sources	<ul style="list-style-type: none"> Where there are large numbers of local sources, the combined effect of these around the façade of the building should be accessed. The façade experiencing the lowest concentration of the pollutants would be an obvious choice for locating ventilation intakes but this will require expert assistance such as numerical and wind tunnel modelling. In general, however, it is recommended that the air intake be positioned as far as possible from the source at a location where air is free to move around the intake.
Weather Factors	<ul style="list-style-type: none"> In areas where predominant wind comes from opposing directions (e.g a valley location) the air intakes and outlets should point in opposite directions. In complex urban layouts, complex wind flows are likely to occur. In these cases, expert advice should be sought.

References

- 1 IAQM, 2012, Air Quality Monitoring in the Vicinity of Demolition and Construction Sites
- 2 IAQM, 2018, Position Statement: Mitigation of Development Air Quality Impacts
- 3 Institute of Environmental Management & Assessment (IEMA), "Guidelines for Environmental Impact Assessment" (2004)
- 4 The Management of Health and Safety at Work Regulations 1999, Regulation 4
- 5 COSHH Regulation 7, Prevention or control of exposure to substances hazardous to health
- 6 Office of the Deputy Prime Minister (2006), Approved Document F, Means of Ventilation