

Appendix 7.1 - Construction Phase Assessment

Construction Dust Risk Assessment Methodology

A construction dust risk assessment has been prepared in accordance with Institute of Air Quality management (IAQM) guidance (2024)¹. This considers the risk of impacts during the construction phase in terms of nuisance dust, human health (PM₁₀ exposure), and ecological impacts.

The IAQM guidance recommends that potential dust emission magnitude is combined with the sensitivity of the area surrounding the Application Site to determine the risk of dust impacts from construction activities.

Activities on construction sites with the potential to generate dust and particulate emissions can be categorised into four types of activities, which have been assessed separately:

- Demolition – any activities associated with the removal of existing structures on a site;
- Earthworks – includes the processes of soil-stripping, ground-levelling, excavation and landscaping;
- Construction – any activities relating to the provision of new structures on site; and
- Trackout – the transport of dust and dirt from a construction site onto the public road network where it may be deposited and re-suspended by traffic using the network.

The potential construction period of the Proposed Development is considered as a whole. It is considered this leads to a conservative assessment when compared to assessing any potential individual phases of construction.

The assessment follows a sequence of steps. Step 1 is a screening assessment, and confirms if a more detailed assessment is required. Step 2 involves defining the magnitude of potential dust emissions, the sensitivity of the area, and combining these to define the risk of dust impacts. Finally, Step 3 uses this information to determine the appropriate level of mitigation required to ensure that there should be no significant impacts, and Step 4 determines the significance of the dust effects after applying the site-specific mitigation.

The sensitivity of the area is defined separately for dust soiling impacts as shown in Table A7.1, human health impacts as shown in Table A7.2, and ecological impacts as shown in Table A7.3.

¹ <https://iaqm.co.uk/wp-content/uploads/2013/02/Construction-Dust-Guidance-Jan-2024.pdf>

Table A7.1: Sensitivity of Area to Dust Soiling Impacts

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

Table A7.2: Sensitivity of Area to Human Health Impacts

Receptor Sensitivity	Annual Mean PM ₁₀ Concentration	Number of Receptors	Distance from Source (m)			
			<20	<50	<100	<250
High	>32 µg/m ³	>100	High	High	High	Low
		10-100	High	High	Medium	Low
		1-10	High	Medium	Low	Low
	28-32 µg/m ³	>100	High	High	Medium	Low
		10-100	High	Medium	Low	Low
		1-10	High	Medium	Low	Low
	24-28 µg/m ³	>100	High	Medium	Low	Low
		10-100	High	Medium	Low	Low
		1-10	Medium	Low	Low	Low
	<24 µg/m ³	>100	Medium	Low	Low	Low
		10-100	Low	Low	Low	Low
		1-10	Low	Low	Low	Low

Receptor Sensitivity	Annual Mean PM ₁₀ Concentration	Number of Receptors	Distance from Source (m)			
			<20	<50	<100	<250
Medium	>32 µg/m ³	>10	High	Medium	Low	Low
		1-10	Medium	Low	Low	Low
	28-32 µg/m ³	>10	Medium	Low	Low	Low
		1-10	Low	Low	Low	Low
	24-28 µg/m ³	>10	Low	Low	Low	Low
		1-10	Low	Low	Low	Low
	<24 µg/m ³	>10	Low	Low	Low	Low
		1-10	Low	Low	Low	Low
	-	>1	Low	Low	Low	Low
		1-10	Low	Low	Low	Low
Low	-	>1	Low	Low	Low	Low

Table A7.3: Sensitivity of the area to ecological impacts

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

The potential dust emission magnitude for each stage of construction (i.e., Demolition, Earthworks, Construction and Trackout) is determined by the scale and magnitude of the works, and is classified depending on the criteria outlined below in Table A7.4.

Table A7.4: Potential Dust Emission Magnitude Criteria

Activity	Dust Emission Magnitude		
	Small	Medium	Large
Demolition	Total building volume <12,000m ³ , construction material with low potential for dust release (e.g., metal cladding or timber), demolition activities <6m above ground, demolition during wetter months.	Total building volume 12,000m ³ – 75,000m ³ , potentially dusty construction material, demolition activities 6-12m above ground level.	Total building volume >75,000m ³ , potentially dusty construction material (e.g., concrete), on-site crushing and screening, demolition activities >12m above ground level.
Earthworks	Total site area <18,000m ² , soil type with large grain size (e.g., sand), <5 heavy earth moving vehicles active at any one time, formation of bunds <3m in height.	Total site area 18,000m ² – 110,000m ² , Mediumly dusty soil type (e.g., silt), 5-10 heavy earth moving vehicles active at any one time, formation of bunds 3m - 6m in height.	Total site area >110,000m ² , potentially dusty soil type (e.g., clay, which will be prone to suspension when dry due to small particle size), >10 heavy earth moving vehicles active at any one time, formation of bunds >6m in height.
Construction	Total building volume <12,000m ³ , construction material with low potential for dust release (e.g., metal cladding or timber).	Total building volume 12,000m ³ – 75,000m ³ , potentially dusty construction material (e.g., concrete), on site concrete batching.	Total building volume >75,000m ³ , on site concrete batching, sandblasting.
Trackout	<20 HDV (>3.5t) outward movements in any one day, surface material with low potential for dust release, unpaved road length <50m.	20-50 HDV (>3.5t) outward movements in any one day, Mediumly dusty surface material (e.g., high clay content), unpaved road length 50m – 100m.	>50 HDV (>3.5t) outward movements in any one day, potentially dusty surface material (e.g., high clay content), unpaved road length >100m.

The construction phase is ultimately assessed as the 'risk of dust impacts' without mitigation (i.e., excluding embedded mitigation), according to the matrices below in Table A7.5, which combines the potential dust emission magnitude and the sensitivity of the area for each stage of construction.

Table A7.5: Risk of Dust Impacts

Area Sensitivity	Potential Dust Emission Magnitude		
	Large	Medium	Small
Demolition			
High	Large	Medium	Medium
Medium	Large	Medium	Small
Low	Medium	Small	Negligible
Earthworks			
High	Large	Medium	Small
Medium	Medium	Medium	Small
Low	Small	Small	Negligible
Construction			
High	Large	Medium	Small
Medium	Medium	Medium	Small
Low	Small	Small	Negligible
Trackout			
High	Large	Medium	Small
Medium	Medium	Medium	Small
Low	Small	Small	Negligible

The risk of impacts can then be determined from the above descriptors and used to determine the appropriate level of mitigation required.

IAQM guidance recommends that significance is only assigned to the effect after considering the construction activity with mitigation. It states:

“For almost all construction activity, the aim should be to prevent significant effects on receptors through the use of effective mitigation. Experience shows that this is normally possible. Hence the residual effect will normally be ‘not significant’”.

Construction Dust Risk Assessment

Construction Traffic

The IAQM's guidance states that, from experience of assessing exhaust emissions from site traffic, it is unlikely that any significant adverse effects on local air quality would be caused and in the vast majority of cases, quantitative assessment is not needed. As such, short term effects of construction traffic emissions have not been assessed.

Demolition

The original Air Quality ES Chapter defined the potential dust emission magnitude as 'Small' based on the demolition of Victoria Farmhouse. However, it should be noted that Victoria Farmhouse was demolished in May 2023, and that no further demolition works are required as part of the Wider OPA. Therefore, demolition has been excluded from the remainder of this assessment.

Earthworks

The total area of the site is above the IAQM's 'Large' threshold of 110,000m². There are likely to be more than 10 heavy moving vehicles active at any one time. Accordingly, the potential dust emission magnitude during Earthworks is considered to be 'Large'.

Construction

The total volume of buildings to be erected is estimated to fall above the IAQM's 'Large' threshold of 75,000 m³ and therefore the dust emissions magnitude during Construction has been classified as 'Large'.

Trackout

Due to the size of the site, the unpaved road network is likely to be greater than 100m in length. In addition, the number of site vehicles is unlikely to exceed the IAQM's 'Medium' threshold of 20-50 HDV (>3.5t) outward movements. Accordingly, the potential dust emission magnitude during Trackout is considered to be 'Medium'.

Sensitivity of Area

The prevailing wind direction for the closest regionally representative meteorological measurement station to the Application, at Southampton Airport is shown in Appendix 7.3 of the original Air Quality ES chapter. The wind rose shows that the prevailing winds are from the south-west. As such, receptors downwind (i.e. north, east/north-east) of the site are more at risk of frequent exposure to dust impacts than those located upwind.

The main areas of human sensitivity are to the north west, north, north-east and east (downwind). Based on the IAQM guidance residential dwellings are considered as high sensitivity receptors in relation to

both dust soiling and health effects of PM₁₀. Indicative examples of medium sensitivity receptors include places of work, such as offices.

There are over 10 high-sensitivity receptors within 20m of the Application Site boundary. According to IAQM guidance, where there are more than 10 high sensitivity receptors within 20m, the overall sensitivity of the surrounding area to nuisance dust soiling effects during Earthworks and Construction is defined as 'High'.

With regard to Trackout, the sensitivity is assessed where receptors are located within 50m from Trackout routes up to 500m from the site. As there are more than 10 high-sensitivity receptors within 50m of the Trackout route, the sensitivity to dust soiling impacts from Trackout is defined as 'High'.

As reported in Table 7.16 of the original Air Quality ES chapter, UK-AIR predictions show that annual mean background concentrations of PM₁₀ are well below 32 µg/m³ in the vicinity of the site (the concentration at which exceedance of the 24-hour AQAL is likely), and are not likely to exceed 24 µg/m³. According to IAQM guidance, where PM₁₀ concentrations are <24 µg/m³ and there are fewer than 100 high sensitivity receptors within 20m of the site boundary, the overall sensitivity of the surrounding area to human health impacts is defined as 'Low' for all stages.

The area surrounding the Wider OPA Site was assessed for the designations listed below:

- Special Protection Areas (SPAs)
- Special Areas of Conservation (SACs)
- Ramsar sites (protected wetlands)
- Sites of Special Scientific Interest (SSSIs)
- Local nature sites (ancient woods, local wildlife sites (SINCs) and national and local nature reserves)

The original Air Quality ES chapter identified Round Copse, West End SINC (reported as E03) as a Low Sensitivity ecological receptor within 20m of the Site boundary. No additional receptors have been identified in this update within the construction phase study area defined in A7.3.

Risk of Impacts

Using the methodology prescribed in the IAQM guidance, the overall risk of impacts can be defined by combining the sensitivity of the area with the potential dust emission magnitude of each stage of the construction phase as described above.

Table A7.6 provides a summary of the revised construction dust risk assessment. Overall, the development is considered to be High Risk for nuisance dust soiling effects, Low Risk for PM₁₀ health effects and to be Low Risk for ecological impacts, in the absence of mitigation.

Table A1.6: Risk of adverse impacts during construction phase

Construction Activity	Risk of Impacts		
	Nuisance Dust Soiling	Human Health	Ecological
Earthworks	High Risk	Low Risk	Low Risk
Construction	High Risk	Low Risk	Low Risk
Trackout	Medium Risk	Low Risk	Low Risk

Appendix 7.2 – Construction Mitigation

In order to mitigate the worst-case dust impacts the following general mitigation measures are highly recommended by the IAQM for High-Risk construction sites. Highly recommended mitigation measures applicable specifically to Demolition, Earthworks, Construction and Trackout are provided based on the respective risk of adverse impact.

Communications

- 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
- 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. In London additional measures may be required to ensure compliance with the Mayor of London's guidance. The DMP may include monitoring of dust deposition, dust flux, real-time PM₁₀ continuous monitoring and/or visual inspections.

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.
- Hold regular liaison meetings with other high risk construction sites within 250 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 inspection, 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 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.
- Agree dust deposition, dust flux, or real-time PM₁₀ continuous monitoring locations with the Local Authority. Where possible commence baseline monitoring at least three months before work commences on site or, if it a large site, before work on a phase commences. Further guidance is provided by IAQM on monitoring during demolition, earthworks and construction.

Preparing and Maintaining the Site

- 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 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.
- Cover, seed or fence stockpiles to prevent wind whipping.

Operating Vehicle / Machinery and Sustainable Travel

- 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.
- Impose and signpost a maximum-speed-limit of 15 mph on surfaced and 10 mph on unsurfaced haul roads and work areas
- Produce a Construction Logistics Plan to manage the sustainable delivery of goods and materials.
- Implement a Travel Plan that supports and encourages sustainable 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 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

Waste Management

- No 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
- Only remove the cover in small areas during work and 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.
- All construction plant and equipment should be maintained in good working order and not left running when not in use

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.
- Ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport.
- 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 10 m from receptors where possible.

Appendix 7.3 – Model Inputs and Verification

An important stage in the modelling process is model verification of the road traffic model, which involves comparing the model output with measured concentrations in order to increase confidence in modelled predictions. According to LAQM.TG (22), the difference between modelled results and monitored concentrations is acceptable where it is within 25% (10% is preferable).

It is 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 output of road- NO_x (i.e., the component of total NO_x coming from road traffic) has been compared with the 'measured' road- NO_x . Measured road- NO_x has been calculated from the measured NO_2 concentrations using the NO_x from NO_2 calculator (Version 8.1) available on the Defra LAQM Support website.

In order to consolidate all previous technical work prepared as part of the original ES and its associated technical responses and addendums, three separate model verification exercises have been undertaken, and the adjustment applied to two study areas, as defined below:

- Main study area
 - NO_2 adjustment based on 8 diffusion tubes;
- Eastleigh AQMA No.1 study area
 - NO_2 adjustment based on two diffusion tubes and an automatic reference analyser;
 - PM_{10} adjustment based on one automatic reference analyser.

The verification process for each of the model verification study areas are outlined below.

Main study area – NO_2 adjustment

The pre-adjusted modelled and monitored verification results are given in Table A7.7.

Table A7.7 - 2019 Modelled and monitored concentrations before adjustment

Monitoring ID	Modelled Road NO_x ($\mu\text{g}/\text{m}^3$)	Monitored Road NO_x ($\mu\text{g}/\text{m}^3$)	Ratio Monitored/Modelled	Modelled Total NO_2 ($\mu\text{g}/\text{m}^3$)	Monitored Total NO_2 ($\mu\text{g}/\text{m}^3$)	Difference (%)
BOT	26.9	38.1	1.4	26.6	31.9	-16.7%
FORSL	40.7	29.2	0.7	33.4	28.0	19.3%
WYV	22.6	21.1	0.9	24.8	24.1	3.0%
FOR	20.3	12.5	0.6	24.1	20.1	19.8%
SWA	16.8	23.8	1.4	25.2	28.6	-12.0%
MS	15.0	17.0	1.1	25.4	26.4	-3.9%

Monitoring ID	Modelled Road NO _x (µg/m ³)	Monitored Road NO _x (µg/m ³)	Ratio Monitored/Modelled	Modelled Total NO ₂ (µg/m ³)	Monitored Total NO ₂ (µg/m ³)	Difference (%)
BR	26.3	38.2	1.5	28.2	33.8	-16.7%
BR2	21.9	32.8	1.5	26.1	31.3	-16.8%

As shown, modelled concentrations of NO_x and NO₂ were within the ideal 25% threshold at all locations, with some within 10%. However, as the model performance varies, with some overpredictions and some underpredictions, an adjustment factor of **1.068** has been determined as the equation of the slope of the best-fit line between the 'measured' road contribution and the model derived road contribution of NO_x, as shown below:

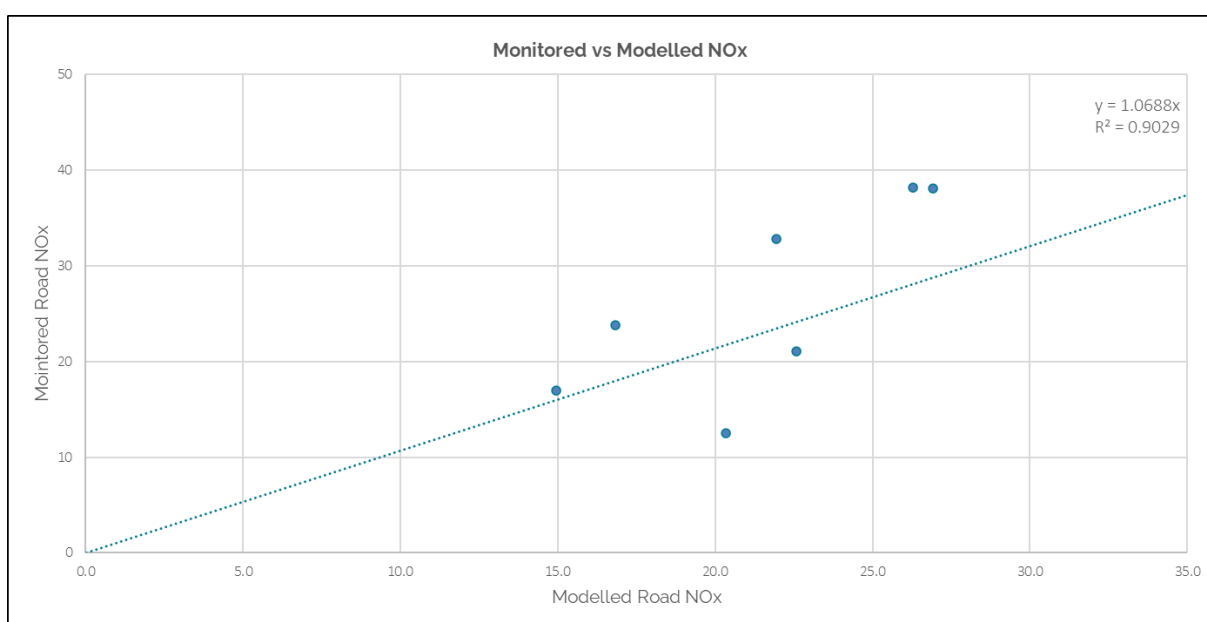


Table A7.8 shows total monitored versus modelled NO₂ following the adjustment of the road contribution of NO_x by this factor. The total NO₂ concentration was determined by adding the background NO₂ concentration to the modelled road contribution.

Table A7.8 – Post-adjusted 2019 Modelled and monitored results

Monitoring ID	Adjusted Modelled NO ₂ (µg/m ³)	Monitored NO ₂ (µg/m ³)	Difference (%)
BOT	27.5	31.9	-13.9%
FORSL	34.7	28.0	23.8%
WYV	25.6	24.1	6.2%
FOR	24.8	20.1	23.3%
SWA	25.7	28.6	-10.0%
MS	25.9	26.4	-1.9%
BR	26.8	31.3	-14.4%
BR2	0.0	0.0	0.0%

Following adjustment of NO_x by a factor of **1.068**, three modelled concentrations of NO₂ were within the ideal 10% range, and the remaining 5 modelled concentrations were within the acceptable 25% range.

In addition, the overall post-adjusted uncertainty (RMSE) for annual mean NO₂ was 4.2µg/m³ which equates to 10.4% of the AQAL, which is within ideal 10% range of uncertainty when rounded. As such, the factor was considered to be acceptable.

Eastleigh AQMA No.1 - NO₂ adjustment

The pre-adjusted modelled and monitored verification results are given in Table A7.9

Table A7.9 - 2019 Modelled and monitored concentrations before adjustment

Monitoring ID	Modelled Road NO _x (µg/m ³)	Monitored Road NO _x (µg/m ³)	Ratio Monitored/Modelled	Modelled Total NO ₂ (µg/m ³)	Monitored Total NO ₂ (µg/m ³)	Difference (%)
SR2	14.9	42.0	2.8	24.7	37.6	-34.3%
ES1	18.2	34.3	1.9	26.4	34.1	-22.6%
SR1	15.3	55.8	3.6	24.9	43.6	-42.8%

As shown, modelled concentrations of NO_x and NO₂ were underpredicted by the model at all locations, and whilst the results were within the 25% threshold at one site, all are outside the ideal 10% threshold. As such, an adjustment factor of **2.67** has been determined as the equation of the slope of the best-fit line between the 'measured' road contribution and the model derived road contribution of NO_x, as shown below:

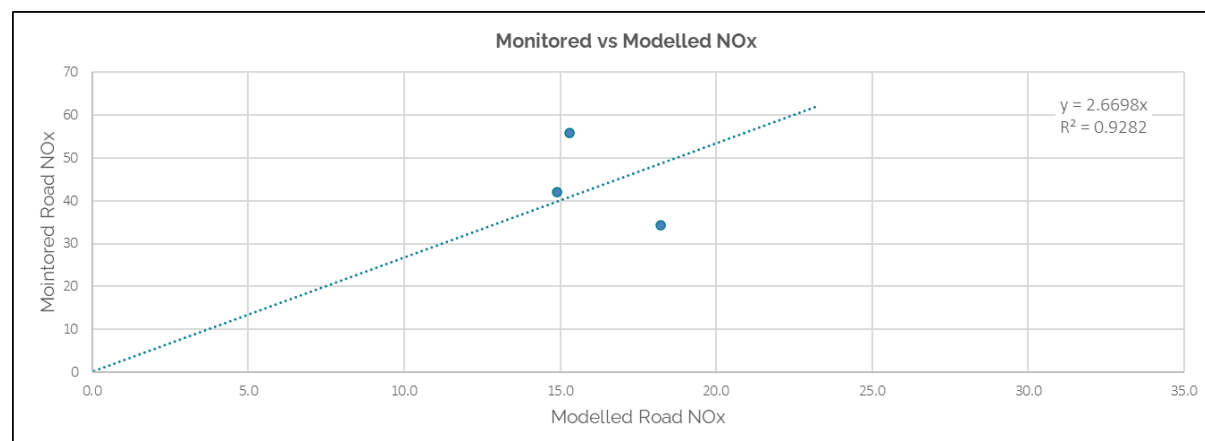


Table A7.10 shows total monitored versus modelled NO₂ following the adjustment of the road contribution of NO_x by this factor. The total NO₂ concentration was determined by adding the background NO₂ concentration to the modelled road contribution.

Table A7.10 – Post-adjusted 2019 Modelled and monitored results

Monitoring ID	Adjusted Modelled NO ₂ (µg/m ³)	Monitored NO ₂ (µg/m ³)	Difference (%)
SR2	36.6	37.6	-2.7%
ES1	36.6	34.1	7.3%
SR1	37.1	43.6	-14.9%

Following adjustment of NO_x by a factor of **2.67**, all modelled concentrations of NO₂ were within 25%, and two were within the ideal 10% range of monitored concentrations.

In addition, the overall post-adjusted uncertainty (RMSE) for annual mean NO₂ was 4.1µg/m³ which equates to 10.2% of the AQAL, which is within ideal 10% range of uncertainty when rounded. As such, the factor was considered to be acceptable.

The verification factor has been applied to the model outputs for the following receptors only, which are located within or in close proximity to the Eastleigh AQMA No.1 study area:

- R09;
- R44;
- R28;
- R34, and
- R35.

ES1 Automatic Monitoring Site: PM₁₀ and PM_{2.5} adjustment

The pre-adjusted modelled and monitored verification results are given in Table A7.11.

Table A7.11 - 2019 Modelled and monitored PM₁₀ concentrations before adjustment

Monitor ID	Site Type	Background PM ₁₀ µg/m ³	Monitored Total PM ₁₀ µg/m ³	Monitored Road PM ₁₀ µg/m ³	Modelled Road PM ₁₀ µg/m ³	Verification Factor
ES1	R	15.1	21.1	6.0	1.9	3.16

A PM₁₀ adjustment factor of **3.16** has been derived based on the difference the monitored and modelled road contribution PM₁₀. It should be noted that LAQM.TG (22) paragraph 7.571 states that care needs to be taken when applying model adjustment based on one monitoring site only as the adjustment may not be representative of other locations. Paragraph 7.572 also states that, in the absence of any PM₁₀ data for verification, it may be appropriate to apply the road-NO_x adjustment to the modelled road-PM₁₀.

Therefore, in accordance with LAQM.TG (22), the PM₁₀ verification factor has been applied to PM₁₀ and PM_{2.5} model outputs for the following receptors only, which are located within or in close proximity to the Eastleigh AQMA No.1 study area:

- R09;
- R44;
- R28;
- R34, and
- R35.

For all other receptors, the road-NO_x adjustment factor derived from the main study area verification has been applied to PM₁₀ and PM_{2.5} model outputs, in accordance with LAQM.TG (22).