AQUIND Limited

AQUIND INTERCONNECTOR

Environmental Statement – Volume 3 – Appendix 23.3 Air Quality Traffic Modelling

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WSP

WSP House

70 Chancery Lane

London

WC2A 1AF

+44 20 7314 5000

www.wsp.com

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AIR QUALITY TRAFFIC MODELLING

1.1. SCOPE OF THE ASSESSMENT

1.1.1. INTRODUCTION

1.1.1.1. This appendix details the methodology for the assessment of traffic impacts that was undertaken for the temporary effects of construction traffic and the temporary effects of road closures and diversions resulting from the construction works for the AQUIND Interconnector.

1.1.2. STUDY AREA

1.1.2.1. The study areas for the construction traffic assessment and the road closure and diversion assessment were defined by the traffic modelling data supplied by Systra as detailed in Chapter 22 Traffic and Transport.

Construction Traffic

1.1.2.2. The construction traffic routes relevant to the converter station and cabling operations are described in Chapter 22 Traffic and Transport, and are shown in Figure 23.3 Following the guidance from the Design Manual for Roads and Bridges (DMRB) (The Highways Agency, 2007), a study area up to 200 m from the road centreline supplied with the traffic model was selected, as beyond this distance air pollutant emissions from traffic are expected to have dispersed to a concentration equivalent to background concentrations. The 200 m study area is shown in Figure 23.3. The supplied traffic flow data was screened against the criteria in Institute of Air Quality Management (IAQM) construction dust assessment guidance (Institute of Air Quality Managment, 2016) and criteria in the IAQM Planning Guidance (Moorcroft, et al., 2017) to obtain an affected road network. Given the sensitivities associated with air quality in the City of Portsmouth area, a decision was taken to include all the supplied construction traffic routes within the study area for assessment as affected roads.

Road Closures and Diversions

1.1.2.3. The road closures and diversions are described in Chapter 22 Traffic and Transport. The traffic data supplied by Systra was screened against criteria from the IAQM planning guidance (Moorcroft, et al., 2017) to obtain an affected road network for assessment. Where an Air Quality Management Area (AQMA) was found to include affected roads, the more stringent criteria from the IAQM Planning Guidance was applied. Professional judgement was used to obtain a contiguous affected road network for assessment that would reflect the movement of traffic in the City of Portsmouth and any associated changes in air quality. Following guidance from the DMRB HA 207/07 (The Highways Agency, 2007), a study area up to 200 m from the

affected road network centreline supplied with the traffic model was selected, as beyond this distance air pollutant emissions from traffic are expected to have dispersed to a concentration equivalent to background concentrations. The 200 m study area is shown in Figure 23.4.

1.2. ASSESSMENT METHODOLOGY

1.2.1. CONSTRUCTION STAGE

Screening

1.2.1.1. Data from the transport assessment was screened against criteria from the IAQM construction dust guidance (Institute of Air Quality Managment, 2016) and the IAQM Planning Guidance (Moorcroft, et al., 2017) in order to obtain an affected road network. Construction traffic was added to the model for traffic diversions by the WSP transport team as detailed in Chapter 21 Traffic and Transport. Where affected links were found to be within an AQMA, the more stringent screening criteria from the IAQM Planning Guidance were applied as in Table 1.

Table 1 - Indicative Traffic Screening Criteria

The development will:	Indicative criteria to Proceed to an Air Quality Assessment
1. Cause a significant change in Light Duty Vehicle (LDV) traffic flows on local roads with relevant receptors. (LDV = cars and small vans <3.5 t gross vehicle weight).	A change of LDV flows of: - more than 100 AADT within or adjacent to an AQMA - more than 500 AADT elsewhere.
2. Cause a significant change in Heavy Duty Vehicle (HDV) flows on local roads with relevant receptors. (HDV = goods vehicles + buses >3.5 t gross vehicle weight).	A change of HDV flows of: - more than 25 AADT within or adjacent to an AQMA - more than 100 AADT elsewhere.

1.2.1.2. This produced an affected road network that included contiguous and non-contiguous sections. Where non-contiguous sections were present, professional judgement was used to join up areas, e.g. between adjacent AQMAs, to produce a collection of contiguous road networks.

1.2.1.3. This was undertaken for each of the two Do-Something scenarios supplied compared to the Do-Minimum Scenario, with the differences compiled such that the affected road network for each of the Do-Something scenarios was the same.

1.2.1.4. Further modification of the affected road network was undertaken following consultation with the relevant Environmental Health Officers (EHO), in particular EHO

for Havant District Council who indicated that only specific areas of the affected road network in the district of Havant would require assessment due to the known presence of elevated concentrations of NO_2 in these areas.

Baseline Year

1.2.1.5. In order that a robust assessment can be undertaken, a Baseline year is required for assessment that can be used to validate the model outputs through comparison with monitored data.

1.2.1.6. The most recent diffusion tube monitoring data (for 2018) was obtained from each of the affected local authorities where it was appropriate. Monitored NO_2 concentrations were converted to NO_x concentrations using the Defra NO_x to NO_2 Calculator v7.0 (May 2019) (Department for the Environment, Food & Rural Affairs, 2019) The supplied traffic data for the 2026 future baseline Do-Minimum scenario was factorised using the Department for Transport Trip End Model Presentation Program (TEMPro) version 7.2 to match the year of the monitored data.

Receptors

1.2.1.7. Representative receptors were chosen covering the entire modelled network based on the methodology used in the Department for Transport WebTAG methodology. representative receptors at distances of 20 m, 70 m, 115 m and 175 m were interpolated either side of each affected link using QuantumGIS (QGIS) v3.8 from the mid-point of each affected road link. Additional representative receptors were interpolated at 4 m from the centre of each affected road link in order to provide an indication of compliance with the EU Directive 2008/50/EC.

Traffic Model

1.2.1.8. Traffic impacts resulting from the proposed development were modelled using the Solent Sub-Regional Transport Model, which is a multi-modal strategic transport model for Hampshire, the Isle of Wight and Portsmouth. The model is operated by the Systra consultancy under contract to Solent Transport. The model includes calibrated 2015 baseline flows and covers predicted travel growth and committed developments up to 2041.

1.2.1.9. Given the length of the cabling works, it is likely that several sections will be worked on at any given point in time. Cabling construction is to be undertaken in 100 m sections, and it has been assumed that up to six 100 m sections will be under working conditions at any one time. Further detail is provided in Chapter 22 Traffic and Transport.

1.2.1.10. Three scenarios are provided as follows:

- 2026 Do-Minimum which outlines conditions without construction of the proposed development;

- 2026 Do-Something 1 (DS1) which incorporates cable works at six locations and lane closures on the northbound carriageway of the A2030 Eastern Road; and
- 2026 Do-Something 2 (DS2) which incorporates cable works at six locations and lane closures on the southbound carriageway of the A2030 Eastern Road.

1.2.1.11. Peak time period for morning and afternoon, along with an interpeak time period were included in the model, however these were not used for the air quality assessment.

1.2.1.12. Data was provided for the air quality assessment in both tabular and GIS formats.

Modelling

1.2.1.13. Once screened, the data for the affected road networks was loaded into Cambridge Environmental Research Consultants (CERC) Atmospheric Dispersion Modelling System for Roads (ADMS-roads) version 4.1.1. Geographical data for the affected road network was extracted using QGIS v3.8, and loaded in the ADMS-roads model.

1.2.1.14. Emissions factors for each of the links within the affected road network were obtained using the Defra Emissions Factor Toolkit v9.0 (Department for Environment, Food & Rural Affairs, 2019).

1.2.1.15. Meteorological data was obtained for the 2018 Baseline year using the RAF Thorney Island monitoring station, with missing cloud cover data for this station filled in using data from the nearby Southampton Airport monitoring station in order to provide the most complete meteorological data file possible. A meteorological data file with 96.6% usable data was produced.

1.2.1.16. The effect of street canyons was examined, and the models were run with- and without the application of the complex street canyon module. Street canyons were determined through the use of OS Mastermap topography data for buildings within 15 m of the road centreline and processed using the ADMS ArcGIS Street Canyon Python Module to produce a complex street canyon file.

Results Processing

1.2.1.17. Modelled NO_x output was converted to NO_2 using the Defra NO_x to NO_2 Calculator and a linear verification applied against monitored NO_2 data from the relevant council. The affected road network was broken down into zones according to the presence of the affected link's geographical location, the presence of monitoring, and the type of link present as shown in Plate 1.Error! Reference source not found.

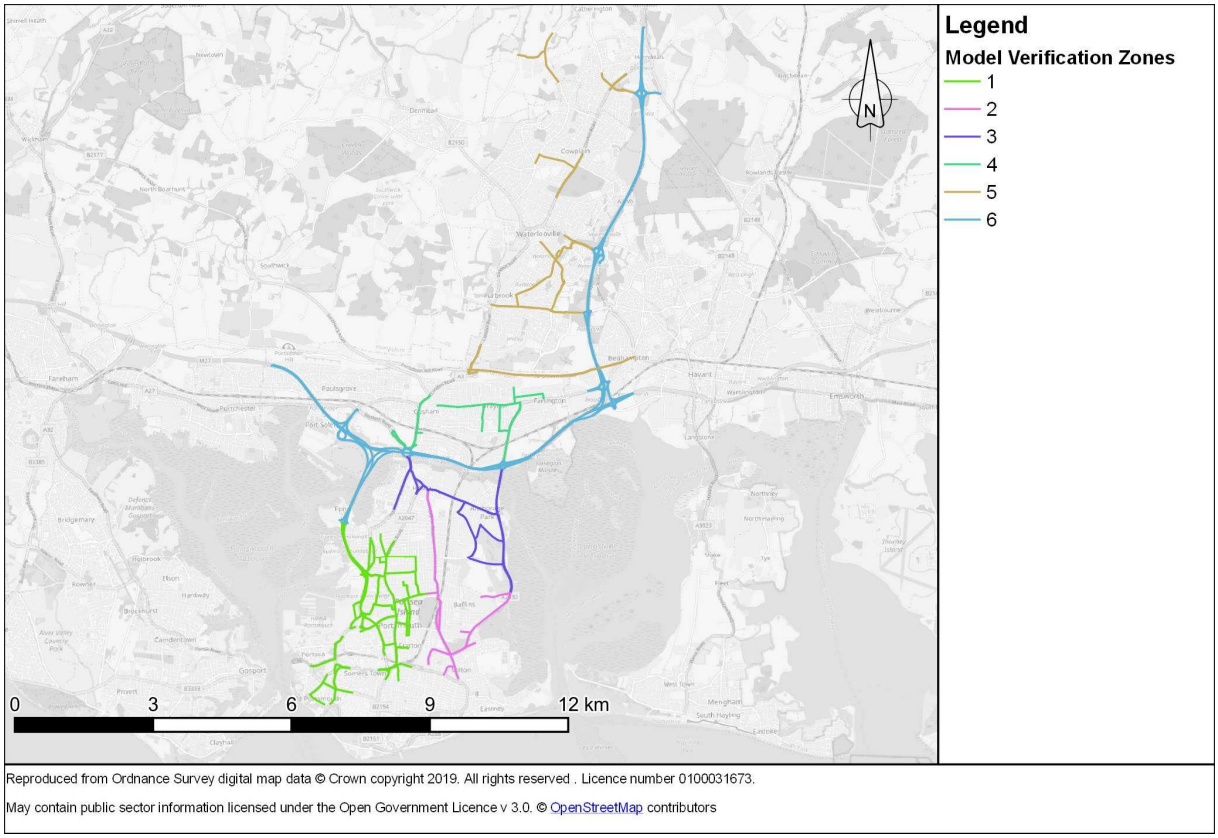

Plate 1 - Model Verification Zones

1.2.1.18. The modelled road component concentrations for each of the representative modelling points were combined with the relevant background concentrations to produce a total concentration. The modelled total concentrations are applied as follows:

- Modelled concentrations at 4 m from the road centreline applied directly to the road link for the purpose of compliance with the EU Directive 2008/50/EC.
- Modelled concentration at 20 m for receptors between 0 m and 50 m from the nearest road centreline;
- Modelled concentration at 70 m for receptors between 50 m and 100 m from the nearest road centreline;
- Modelled concentration at 115 m for receptors between 100 m and 150 m from the nearest road centreline; and
- Modelled concentration at 175 m for receptors between 150 m and 200 m from the nearest road centreline.

1.2.1.19. A spatial join was performed on all receptors within 200 m of the affected road link was performed to determine the closest affected road link and thus which concentration should be applied.

Minimising Uncertainty

1.2.1.20. Discrepancies may occur between measured and modelled concentrations for several reasons including:

- Traffic data uncertainties, including estimates of speeds, total flows and proportions of vehicle types;
- Emission estimates for vehicles using Emission Factors Toolkit v9 are based on Defra predictions;
- Estimates of background concentrations and future trends;
- The use of meteorological data which is not representative of the application site;
- NO_x:NO_2 conversion using the Defra conversion tool v7;
- Known limitations to the ADMS v4.1.1 modelling software, and
- The precision and accuracy of monitoring methods.

1.2.1.21. Disparities between modelling and monitoring results are likely to be a result of a combination of all these aspects.

1.2.1.22. A number of steps were taken to either minimise uncertainty in the modelling process or, where this was not possible, to follow a conservative approach to avoid the risk of underprediction of pollutant concentrations.

- **Verification** is the process by which uncertainties such as those described above are investigated and minimised. Annual mean roadside NO_x concentrations were predicted using the ADMS-Roads modelling software for the derived baseline scenario. A comparison of modelled vs. monitored annual mean roadside NO_x concentrations was undertaken for a large number of NO_2 diffusion tube locations described in Section 1.4. These locations were used as they were considered reflective of the variation in air quality over the area of the affected road links, and traffic data was available from Systra to verify performance.
- **Verification zones** (Plate 1) were chosen based on the availability of monitoring data, similarity of geographic features (e.g. road type and density, built-up or open areas and presence of AQMAs). Verification zones allow for different adjustment factors to be applied to the model that may better suit the location as opposed to a uniform verification.
- An **adjustment factor** was derived from the linear interpolation of the monitored NO_x values and modelled NO_x predictions according to the Diffusion Tubes for Ambient NO_2 Monitoring: Practical Guidance for Laboratories and Users guidance document (AEA Energy & Environment, 2008).

- **Meteorological sensitivity** is considered where dispersion conditions from different years may affect predicted concentrations. Testing for the point source modelling revealed 2014 produced the worst-case model outputs, however traffic data was not provided for a Baseline year. In order to obtain a baseline year for traffic data, the supplied data had to be de-growthed using TEMPro v7. It was considered that it was more appropriate to undertake this operation for the latest year for which ratified monitoring was available (2018) rather than adjusting the data further.
- Due to the differing effects that **meteorology** might have for receptors on each side an affected link, the concentrations on each side of affected links were calculated, and the highest concentration applied to receptors on both sides of the affected link in order to provide a conservative prediction.
- Background pollutant concentrations were obtained from the **Defra Background Air Quality Archive** as these were found to provide more conservative estimates than monitoring. Background monitoring was also not available over many areas of the affected road network, therefore for consistency the Defra values were used.
- Vehicle emission standards/EFTs were obtained using the **Defra Emissions Factor Toolkit v9**. The projections for fleet composition and fuel use in EFT v9 are based on current predictions and available information derived from the Aristotle University of Thessaloniki COPERT model, which is the accepted standard by EU institutions. There are, however, a number of uncertainties in the data which include:
    - Future fleet mix as a result of commitments such as those from the UK Government to be net carbon neutral by 2050, and to ban the sale of fossil-fuelled (petrol and diesel) powered vehicles by 2040;
    - Uncertainty as to the impact on emissions of the introduction of the World-harmonised Light-duty Test Procedure (WLTP);
    - The proportion of Euro 6 vehicles in the fleet that were not required to meet the WLTP for which NO_x emissions are underestimated; and
    - Unknown deterioration and failure rates for complex emissions control systems in Euro 6 vehicles.

Considering these factors, and the large number of assumptions and additional local traffic monitoring required in producing a customised COPERT output, the Defra EFT v9 remains the best option for representing vehicle emissions.

- **Street canyons** were derived using the OS Mastermap Topography dataset with the building height attribute applied for all buildings within 15 m of affected links, and the modelled road network exported from the ADMS-roads Mapping tool. These datasets were processed using the CERC ADMS Canyon python tool for ArcGIS and the impact of their use was investigated. The outputs from this tool were found to be highly conservative, creating canyon data where few or no buildings existed on a road link. The model was then run with and without the inputs created by the canyon tool, and the most appropriate result used for the relevant reporting. In the case of general outputs for traffic diversions and construction traffic, more conservative results were found without the application of the canyon tool given the coarse output from the model and minimum modelled distance from the affected link centreline of 20 m. In the case of compliance with the EU Directive 2008/50/EC, the opposite was found to be true where the modelled distance from the affected link centreline was 4 m. Verification factors were derived for the model outputs both with- and without the street canyon module. The model correction factors with the street canyon were generally found to be lower for the six verification zones, however the error within the model was found to be not significantly affected. Sensitive receptor pollutant concentration predictions were made without the use of the complex canyon tool, and predictions for the assessment of compliance with the EU Directive 2008/50/EC were made with the use of the complex canyon tool.
- A **Root Mean Squared Error** test was applied to the monitored and modelled data used for verification, both before and after correction. Consistently high errors were recorded in the monitored vs modelled data both from the data with and without the street canyon module, suggesting an incompatibility between the type of monitoring undertaken for LAQM purposes where the locations representative of worst exposure are monitored (largely roadside), and the type of monitoring required for model verification purposes where locations representative of more general exposure and network specific background locations would be required. Where the RMSE was changed in an unacceptable manner, i.e. a large increase, then this test was used for the judgement not to apply a correction factor.

1.2.2. DECOMMISSIONING

1.2.2.1. Works for decommissioning are expected to be equivalent to those involved in construction. The effects of sustainable transport policies on traffic flows are not known over the minimum 40-year lifespan of the proposed development, neither are the effects of emissions legislation and improving technology on vehicle emissions.

1.3. BASELINE ENVIRONMENT

1.3.1. LOCAL AIR QUALITY MANAGEMENT

1.3.1.1. The following section provides relevant Local Air Quality Management (LAQM) information from the affected local authorities in addition to the baseline data provided in Chapter 23 Air Quality.

Havant

1.3.1.2. Within the district of Havant there are no AQMAs relevant to the proposed development described in the 2018 Annual Status Report (Havant Borough Council, 2019). Diffusion tube monitoring results for the 2018 baseline year were obtained directly from the EHO, and the relevant results are shown in Table 2.

Table 2 - Relevant Havant Diffusion Tube Results

ID	Location	x	y	In AQMA?	2018 NO_2 (µg/m³)
HA8	London Road (Purbrook)	467322	107976	No	27.8
HA10	Ramblers Way	470032	110043	No	21.4
HA25(B)	Stakes Road	468479	107721	No	26.8

1.3.1.3. Section 4 falls wholly within the local authority area, however traffic from sections 1, 2, 3 and 4 are likely to use roads within the local authority area. All results are below 70 % of the annual mean limit value for NO_2.

City of Portsmouth

1.3.1.4. There are four AQMAs within the city of Portsmouth that are likely to be affected by traffic as a result of road closures and diversions, and generated construction traffic. These are AQMAs 6, 7, 9 and 11, all of which are declared for exceedances of the NO_2 limit value of 40 µg/m³. The 2019 ASR (Portsmouth City Council, 2019) details that monitored concentrations within the AQMA all continue to exceed the limit value for NO_2 of 40 µg/m³, except for AQMA 9 where the monitored concentration is 37.8 µg/m³. Portsmouth City Council is in the process of reviewing its current Air Quality Action Plan.

1.3.1.5. Relevant diffusion tube monitoring data are shown in Table 3.

Table 3 - Relevant city of Portsmouth Diffusion Tube Monitoring Results

ID	Location	x	y	In AQMA?	2018 NO_2 (µg/m³)
PO 1	Lord Montgomery Way (LMW-FST)	463872	99874	Yes	42.9
PO 2	12 Chadderton Gardens (CG-12)	463705	99371	No	17.1

ID	Location	x	y	In AQMA ?	2018 NO_2 ($\mu g/m^3$)
PO 3	121A High Street (HS-121A)	463408	99460	Yes	24.1
PO 5	119 Whale Island Way (WIW-119)	464230	102194	No	28.1
PO 6	88 Stanley Road (SR-88)	464331	102197	No	30.9
PO 7	138 Lower Derby Road (LDR-138)	464291	102279	No	27.7
PO 8	492 Hawthorn Crescent (HC-492)	466690	104355	No	26.0
PO 9	6 Northern Road (NR-6)	465621	105528	No	36.7
PO 11	Anchorage Road, Column 6 (AR-Col6)	466869	103457	No	22.9
PO 14	4 Merlyn Drive (MD-4)	466109	103736	No	21.7
PO 15	29 Milton Road (MR-29)	466120	101324	No	27.6
PO 16	Parade Court, London Road (LR-PC)	465474	104205	No	29.6
PO 18	4 Milton Road (MR-4)	466097	101332	No	26.0
PO 19	7 Velder Avenue (VA-7)	466392	100226	Yes	37.7
PO 23	106 Victoria Road North (VRN-106)	464974	99766	No	34.6
PO 24	221 Fratton Road (FR-221)	465111	100737	Yes	36.8
PO 25	117 Kingston Road (KR-117)	465036	101547	Yes	38.2

ID	Location	x	y	In AQMA ?	2018 NO_2 ($\mu g/m^3$)
PO 26	The TAP (PH), London Road (LR-TAP)	464900	101976	Yes	46.0
PO 30	Market Tavern (PH), Mile End Road (MER-MT)	464478	101457	Yes	39.2
PO 32	Larch Court, Church Road (CR-Corner)	464559	100980	No	31.9
PO 34	Sovereign Gate, Commercial Road (CR-UF)	464425	100893	Yes	33.3
PO 35	Hampshire Terrace (HT-AM)	463837	99759	No	30.1
PO 37	London Road	464925	102129	Yes	40.6
PO 38	Gatcombe Park (AURN)	465403	103952	No	18.7
PO 39	Burrfields Road	466004	102348	No	34.0
PO 40	Mile End Road	464397	101270	Yes	34.0
PO 42	Admiral Drake (PH), Kingston Crescent (KC-ADPH)	464552	101940	Yes	38.1
PO 43	Vanguard House, Kingston Crescent (KC-VH)	464774	101922	No	32.5
PO 48	28 Stamshaw Road East (SR-E28)	464597	102119	No	30.5
PO 53	DEFRA CAQMS, Anglsea Road (AR-DEFRA)	463835	100259	No	30.5
PO 56	Gunwharf Road, Column 4 (GWR-Col4)	463261	99782	No	35.1
PO 57	23 St Nicolas Street (StNS-23 Formal StJSc-Col7)	463478	99348	No	20.3

ID	Location	x	y	In AQMA ?	2018 NO_2 ($\mu g/m^3$)
PO 58	9 St Georges Street (St GS-9)	463487	99659	No	29.3
PO 61	1/10 Southwick House Milton Road. On the fence (MR- SH)	466136	100610	No	33.7
PO 62	12 Hambrook House Milton Road (MR-HH)	466165	100573	No	22.0
PO 63	209 Milton Road (SR-209)	466354	100172	Yes	34.2
PO 65	12ooring Way (MW-12)	466681	100373	Yes	28.2
PO 66	1 Velder Avenue (VA-1)	466267	100216	Yes	31.9
PO 67	23 Velder Avenue (VA-23)	466457	100253	Yes	36.7
PO 68	36 Velder Avenue (VA-36)	466501	100277	Yes	36.9
PO 71	19 Havant Road (HR-19)	465711	105624	No	27.8
PO 72	60 Northern Road (NR-60)	465657	105577	No	26.5
PO 73	52 Northern Road (NR-52)	465653	105544	No	27.4
PO 75	1-6 Chipstead House, Southampton Road (SR-CH)	465618	105619	No	25.7
PO 76	142 Copnor Road (CR-142)	466002	102053	No	31.3
PO 77	Copnor School Playground, Copnor Road (CR-School)	466008	102097	No	21.2
PO 78	3 Goldsmith Avenue (GA-3)	466523	99599	No	25.0

ID	Location	x	y	In AQMA ?	2018 NO_2 (µg/m³)
PO 86	91 Fawcett Road (FR-91)	465201	99734	No	28.9
PO 87	Priory School, Fawcett Road (FR-PSc)	465183	99904	No	27.3
PO 90	18 Baffins Road (BR-18)	466095	100813	No	24.0
PO 91	3 Baffins Road (BR-3)	466070	100819	No	26.7
PO 92	Locksway Road-13 (LR-13)	466525	99736	No	27.3

1.3.1.6. Sections 5, 6, 7, 8, 9 and 10 are located wholly within the local authority area, and section 4 partially within the local authority area. Concentrations recorded at PO1, PO26 and PO37, located inside AQMAs, were above the 40 µg/m³ limit value.

1.4. PREDICTED IMPACTS

1.4.1. DIVERSION TRAFFIC

Construction Stage

Embedded Mitigation

1.4.1.1. Embedded mitigation is described in the Construction Traffic Management Plan ('CTMP'), and includes the following:

- Temporary traffic signals to be used where lane closures or partial carriageway closure is required. during peak times the signals will be manually adjusted to ensure delays are kept to a minimum;
- Road closures may be required where the highway is of insufficient width to accommodate works and have traffic continue to flow at a safe distance. Where this is required diversion routes will be agreed with the local highways authority; and

- Construction hours will be scheduled to avoid peak times, especially where schools are in the immediate vicinity of works, and to avoid particular major scheduled events.

Impacts

1.4.1.2. The overall impacts for the DS1 scenario are presented in Figure 23.6, Figure 23.7 and Figure 23.10 and for the DS2 scenario in Figure 23.9, Figure 23.8 and Figure 23.11.

Verification Zone 1

1.4.1.3. Within this Verification Zone, the number of impacted receptors is shown in Table 4.

Table 4 - Impacted Receptors in Verification Zone 1

Type	Receptor Count
Residential	29,424
Commercial	1,719
Community	176
Military	7
Total Number of Receptors	**31,326**

1.4.1.4. Within the numbers of receptors shown in Table 4, there are receptors with particular sensitivity, as shown in Table 5.

Table 5 - Particularly Sensitive Receptors in Verification Zone 1

Sensitive Receptor	Receptor Count
Schools	80
Medical	33
Hospice	0
Sheltered Accommodation	0
Care Home	12

1.4.1.5. During the construction stage a summary of the results for road closure and diversion traffic for the DS1 scenario are shown in Table 6.

Table 6 - Non-construction Related Traffic Assessment Results for the Do-Something Scenario 1 (2026) for Verification Zone 1

		Construction Scenario DS1 2026		
Pollutant		**NO_2**	**PM_{10}**	**$PM_{2.5}$**
Annual Mean Limit Value (µg/m³)		**40**	**40**	**25**
Number of properties greater than limit value	DM (2026) Maximum Modelled Concentration	39.7	23.0	14.0
	DS1 (2026) Maximum Modelled Concentration	39.2	23.0	14.1
	Removed Exceedances	0	0	0
	New Exceedances	0	0	0
Total Number of Properties	Improvement in Concentration	1,920	482	0
	No Change in Concentration	22,967	25,747	30,504
	Deterioration in Concentration	6,439	5,097	822
Do Something-Do Minimum Annual Mean Change (µg/m³)	Maximum Improvement	-0.7	-0.1	0
	Maximum Deterioration	0.5	0.2	0.1

1.4.1.6. The summary results in Table 6 show that there is an improvement of 0.5 µg/m^3 in the highest predicted concentration at receptors within Verification Zone 1 for NO_2 in the DS1 scenario. The maximum DS1 concentration of 39.2 µg/m^3 is just under the objective. There is no change in the highest predicted concentrations for PM10 and $PM_{2.5}$.

1.4.1.7. For NO_2, PM_{10} and $PM_{2.5}$, concentrations are not predicted to change at most of the receptors assessed for the DS1 scenario. However, more receptors will experience a deterioration than an improvement in this scenario. Whilst some properties are shown to experience a deterioration in concentrations of all pollutants, the highest predicted deterioration is of a lower magnitude than the highest predicted improvement for NO_2 PM10 and $PM_{2.5}$.

1.4.1.8. A summary of the results for diversions and road closures for the DS2 scenario are shown in Table 7.

Table 7 - Non-construction Related Traffic Assessment Results for the Do-Something Scenario 2 (2026) for Verification Zone 1

		Construction Scenario DS2 2026		
Pollutant		**NO_2**	**PM_{10}**	**$PM_{2.5}$**
Annual Mean Limit Value (µg/m³)		**40**	**40**	**25**
Number of properties greater than limit value	DM (2026) Maximum Modelled Concentration	39.7	23.0	14.0
	DS2 (2026) Maximum Modelled Concentration	39.2	23.0	14.1
	Removed Exceedances	0	0	0
	New Exceedances	0	0	0
Total Number of Properties	Improvement in Concentration	3,605	183	298
	No Change in Concentration	26,618	28,854	30,655
	Deterioration in Concentration	1,103	2,289	373
Do Something-Do Minimum Annual Mean Change (µg/m³)	Maximum Improvement	-0.7	-0.1	-0.1
	Maximum Deterioration	0.2	0.1	0.1

1.4.1.9. The summary results in Table 7 show that there is an improvement of 0.5 µg/m^3 in the highest predicted concentration at receptors within the study area for NO_2 in the DS2 scenario. The maximum DS2 concentration of 39.2 µg/m^3 is just under the objective which is the same as the DS1 scenario. There is a small reduction in the highest predicted concentrations for PM_{10} and $PM_{2.5}$.

1.4.1.10. For NO_2, PM_{10} and $PM_{2.5}$, concentrations are not predicted to change at most of the receptors assessed for the DS1 scenario. However, more receptors will experience a deterioration than an improvement in this scenario DS2. Whilst some properties are shown to experience a deterioration in concentrations of all pollutants, the highest predicted deterioration is of a lower magnitude than the highest predicted improvement for NO_2 PM_{10} and $PM_{2.5}$.

1.4.1.11. Areas of predicted improvement are modelled in the vicinity of planned temporary road closures as part of the proposed development.

Verification Zone 2

1.4.1.12. Within this Verification Zone, the number of impacted receptors is shown in Table 8.

Table 8 - Impacted Receptors in Verification Zone 2

Type	Receptor Count
Residential	9,206
Commercial	410
Community	55
Military	0
Total Number of Receptors	**9,671**

1.4.1.13. Within the numbers of receptors shown in Table 8, there are receptors with particular sensitivity, as shown in Table 9.

Table 9 - Particularly Sensitive Receptors in Verification Zone 2

Sensitive Receptor	Receptor Count
Schools	14
Medical	22
Hospice	4
Sheltered Accommodation	1
Care Home	42

1.4.1.14. During the construction stage a summary of the results for road closure and diversion traffic for the DS1 scenario are shown in Table 10.

Table 10 - Non-construction Related Traffic Assessment Results for the Do-Something Scenario 1 (2026) for Verification Zone 2

		Construction Scenario DS1 2026		
Pollutant		**NO_2**	**PM_{10}**	**$PM_{2.5}$**
Annual Mean Limit Value (µg/m³)		**40**	**40**	**25**
Number of properties greater than limit value	DM (2026) Maximum Modelled Concentration	22.3	20.3	13.0

		Construction Scenario DS1 2026		
Pollutant		**NO_2**	**PM_{10}**	**$PM_{2.5}$**
Annual Mean Limit Value (µg/m³)		**40**	**40**	**25**
	DS1 (2026) Maximum Modelled Concentration	22.2	20.3	13.0
	Removed Exceedances	0	0	0
	New Exceedances	0	0	0
Total Number of Properties	Improvement in Concentration	2,741	2,318	477
	No Change in Concentration	4,082	5,756	8,648
	Deterioration in Concentration	2,848	1,597	546
Do Something-Do Minimum Annual Mean Change (µg/m³)	Maximum Improvement	-0.8	-0.3	-0.1
	Maximum Deterioration	0.4	0.2	0.1

1.4.1.15. The summary results in Table 10 show that there is a negligible improvement of 0.1 µg/m^3 in the highest predicted concentration at receptors within Verification Zone 2 for NO_2 in the DS1 scenario. The maximum DS1 concentration of 22.2 µg/m^3 is significantly under the objective. There is no change in the highest predicted concentrations for PM_{10} and $PM_{2.5}$.

1.4.1.16. For NO_2, PM_{10} and $PM_{2.5}$, concentrations are not predicted to change at the majority of the receptors assessed for the DS1 scenario. For NO_2 and $PM_{2.5}$, more receptors are predicted to experience a deterioration, whilst for PM_{10} more receptors are predicted to experience an improvement in concentrations. Overall, the level of maximum improvement is greater than the maximum deterioration, except for $PM_{2.5}$ where they are equal.

1.4.1.17. A summary of the results for diversions and road closures for the DS2 scenario are shown in Table 11.

Table 11 - Non-construction Related Traffic Assessment Results for the Do-Something Scenario 2 (2026) for Verification Zone 2

		Construction Scenario DS2 2026		
Pollutant		**NO_2**	**PM_{10}**	**$PM_{2.5}$**
Annual Mean Limit Value (µg/m³)		**40**	**40**	**25**
Number of properties greater than limit value	DM (2026) Maximum Modelled Concentration	22.3	20.3	13.0
	DS2 (2026) Maximum Modelled Concentration	22.3	20.3	13.1
	Removed Exceedances	0	0	0
	New Exceedances	0	0	0
Total Number of Properties	Improvement in Concentration	1,604	535	21
	No Change in Concentration	7,295	8,267	9,089
	Deterioration in Concentration	772	869	561
Do Something-Do Minimum Annual Mean Change (µg/m³)	Maximum Improvement	-0.3	-0.1	-0.1
	Maximum Deterioration	0.1	0.1	0.1

1.4.1.18. The summary results in Table 11 show that there is no change in the highest predicted concentration at receptors within the study area for NO_2 in the DS2 scenario. There is a negligible 0.1 µg/m³ increase in the highest predicted concentration of $PM_{2.5}$.

1.4.1.19. For all modelled pollutants, concentrations are not predicted to change at the majority of receptors assessed for the DS2 scenario. Whilst a larger number of receptors are predicted to experience an improvement in ambient NO_2 concentrations, a larger number of receptors are predicted to experience a deterioration in ambient particulate concentrations.

Verification Zone 3

1.4.1.20. Within Verification Zone 3, the number of impacted receptors is shown in Table 12.

Table 12 - Impacted Receptors in Verification Zone 3

Type	Receptor Count
Residential	2,868
Commercial	398
Community	17
Military	0
Total Number of Receptors	**3,283**

1.4.1.21. Within the numbers of receptors shown in Table 12, there are receptors with particular sensitivity, as shown in Table 13.

Table 13 - Particularly Sensitive Receptors in Verification Zone 3

Sensitive Receptor	Receptor Count
Schools	10
Medical	0
Hospice	0
Sheltered Accommodation	0
Care Home	82

1.4.1.22. During the construction stage a summary of the results for road closure and diversion traffic for the DS1 scenario are shown in Table 14.

Table 14 - Non-construction Related Traffic Assessment Results for the Do-Something Scenario 1 (2026) for Verification Zone 3

		Construction Scenario DS1 2026		
Pollutant		**NO_2**	**PM_{10}**	**$PM_{2.5}$**
Annual Mean Limit Value (µg/m³)		**40**	**40**	**25**
Number of properties greater than limit value	DM (2026) Maximum Modelled Concentration	24.2	21.5	12.4
	DS1 (2026) Maximum Modelled Concentration	24.3	21.7	12.4
	Removed Exceedances	0	0	0
	New Exceedances	0	0	0
Total Number of Properties	Improvement in Concentration	67	120	16
	No Change in Concentration	2370	2664	2767
	Deterioration in Concentration	846	499	500
Do Something-Do Minimum Annual Mean Change (µg/m³)	Maximum Improvement	-0.5	-0.3	-0.1
	Maximum Deterioration	0.4	0.2	0.1

1.4.1.23. The summary results in Table 14 show a negligible predicted deterioration in the maximum concentration at receptors within Verification Zone 3 for NO_2 of 0.1 µg/m³ in the DS1 scenario. The maximum DS1 concentration of 24.3 µg/m^3 is under the objective. There is a negligible increase in the highest predicted concentrations for PM_{10} and no change in the highest predicted concentration of $PM_{2.5}$.

1.4.1.24. For NO_2, PM_{10} and $PM_{2.5}$, concentrations are not predicted to change at the majority of the receptors assessed for the DS1 scenario. For all modelled pollutants a greater number of receptors are predicted to experience a deterioration in receptors compared to those that are predicted to experience an improvement.

1.4.1.25. A summary of the results for diversions and road closures for the DS2 scenario are shown in Table 15.

Table 15 - Non-construction Related Traffic Assessment Results for the Do-Something Scenario 2 (2026) for Verification Zone 3

		Construction Scenario DS2 2026		
Pollutant		**NO_2**	**PM_{10}**	**$PM_{2.5}$**
Annual Mean Limit Value (µg/m³)		**40**	**40**	**25**
Number of properties greater than limit value	DM (2026) Maximum Modelled Concentration	24.2	21.5	12.4
	DS2 (2026) Maximum Modelled Concentration	24.3	21.6	12.4
	Removed Exceedances	0	0	0
	New Exceedances	0	0	0
Total Number of Properties	Improvement in Concentration	236	52	7
	No Change in Concentration	2175	2695	2928
	Deterioration in Concentration	872	536	348
Do Something-Do Minimum Annual Mean Change (µg/m³)	Maximum Improvement	-0.3	-0.2	-0.1
	Maximum Deterioration	0.4	0.2	0.1

1.4.1.26. The summary results in Table 15 show a negligible predicted deterioration in the maximum concentration at receptors within Verification Zone 3 for NO_2 of 0.1 µg/m³ in the DS1 scenario. The maximum DS1 concentration of 24.3 µg/m^3 is under the objective. There is a negligible increase in the highest predicted concentrations for PM_{10} and no change in the highest predicted concentration of $PM_{2.5}$.

1.4.1.27. For all modelled pollutants, concentrations are not predicted to be unchanged at the majority of receptors assessed for the DS2 scenario. A larger number of receptors are predicted to experience an improvement in ambient concentrations of all modelled pollutants compared to those predicted to experience an improvement.

Verification Zone 4

Within Verification Zone 4, the number of impacted receptors is shown in Table 16.

Table 16 - Impacted Receptors in Verification Zone 4

Type	Receptor Count
Residential	4,890
Commercial	363
Community	49
Military	0
Total Number of Receptors	**5,302**

1.4.1.28. Within the numbers of receptors shown in Table 16, there are receptors with particular sensitivity, as shown in Table 17.

Table 17 - Particularly Sensitive Receptors in Verification Zone 4

Sensitive Receptor	Receptor Count
Schools	11
Medical	24
Hospice	0
Sheltered Accommodation	0
Care Home	11

1.4.1.29. During the construction stage a summary of the results for road closure and diversion traffic for the DS1 scenario are shown in Table 18.

Table 18 - Non-construction Related Traffic Assessment Results for the Do-Something Scenario 1 (2026) for Verification Zone 4

		Construction Scenario DS1 2026		
Pollutant		**NO_2**	**PM_{10}**	**$PM_{2.5}$**
Annual Mean Limit Value (µg/m³)		**40**	**40**	**25**
Number of properties greater than limit value	DM (2026) Maximum Modelled Concentration	31.6	22.0	13.0
	DS1 (2026) Maximum Modelled Concentration	31.3	22.0	13.0
	Removed Exceedances	0	0	0
	New Exceedances	0	0	0
Total Number of Properties	Improvement in Concentration	386	289	247
	No Change in Concentration	3,400	4,174	4,770
	Deterioration in Concentration	1516	839	285
Do Something-Do Minimum Annual Mean Change (µg/m³)	Maximum Improvement	-0.6	-0.3	-0.1
	Maximum Deterioration	0.5	0.2	0.1

1.4.1.30. The summary results in Table 18 show that there is an improvement of 0.1 µg/m^3 in the highest predicted concentration at receptors within Verification Zone 4 for NO_2 in the DS1 scenario. The maximum DS1 concentration of 31.3 µg/m^3 is under the objective. There is no change in the highest predicted concentrations for PM_{10} and $PM_{2.5}$.

1.4.1.31. For all modelled pollutants, concentrations are not predicted to change at the majority of the receptors assessed for the DS1 scenario. For all modelled pollutants, more receptors are predicted to experience a deterioration than an improvement. Overall, the level of maximum improvement is greater than the maximum deterioration, except for $PM_{2.5}$ where they are equal.

1.4.1.32. A summary of the results for diversions and road closures for the DS2 scenario are shown in Table 19.

Table 19 - Non-construction Related Traffic Assessment Results for the Do-Something Scenario 2 (2026) for Verification Zone 4

		Construction Scenario DS2 2026		
Pollutant		**NO_2**	**PM_{10}**	**$PM_{2.5}$**
Annual Mean Limit Value (µg/m³)		**40**	**40**	**25**
Number of properties greater than limit value	DM (2026) Maximum Modelled Concentration	31.6	22.0	13.0
	DS2 (2026) Maximum Modelled Concentration	31.4	22.1	13.0
	Removed Exceedances	0	0	0
	New Exceedances	0	0	0
Total Number of Properties	Improvement in Concentration	309	249	247
	No Change in Concentration	3,510	4,181	4,778
	Deterioration in Concentration	1,483	872	277
Do Something-Do Minimum	Maximum Improvement	-0.6	-0.3	-0.1

		Construction Scenario DS2 2026		
Pollutant		**NO_2**	**PM_{10}**	**$PM_{2.5}$**
Annual Mean Limit Value (µg/m³)		**40**	**40**	**25**
Annual Mean Change (µg/m³)	Maximum Deterioration	0.2	0.2	0.1

1.4.1.33. The summary results in Table 19 show that there is a predicted negligible improvement of 0.2 µg/m³ in the maximum concentration of NO_2 and a predicted negligible improvement of 0.1 µg/m³ in the maximum concentration of PM_{10}. The maximum concentration of $PM_{2.5}$ is predicted to be unchanged.

1.4.1.34. For all modelled pollutants, concentrations are not predicted to change at the majority of receptors assessed for the DS2 scenario. Whilst a larger number of receptors are predicted to experience a deterioration in concentrations for all modelled pollutants, the maximum improvement in concentrations are predicted to be larger than the maximum deterioration, except for $PM_{2.5}$ where they are of equal magnitude.

Verification Zone 5

1.4.1.35. Within Verification Zone 5, the number of impacted receptors is shown in Table 20.

Table 20 - Impacted Receptors in Verification Zone 5

Type	Receptor Count
Residential	7,324
Commercial	255
Community	37
Military	1
Total Number of Receptors	**7,617**

1.4.1.36. Within the numbers of receptors shown in Table 20, there are receptors with particular sensitivity, as shown in Table 21.

Table 21 - Particularly Sensitive Receptors in Verification Zone 5

Sensitive Receptor	Receptor Count
Schools	11
Medical	7
Hospice	0
Sheltered Accommodation	0
Care Home	18

1.4.1.37. During the construction stage a summary of the results for road closure and diversion traffic for the DS1 scenario are shown in Table 22.

Table 22 - Non-construction Related Traffic Assessment Results for the Do-Something Scenario 1 (2026) for Verification Zone 5

		Construction Scenario DS1 2026		
Pollutant		**NO_2**	**PM_{10}**	**$PM_{2.5}$**
Annual Mean Limit Value (µg/m³)		**40**	**40**	**25**
Number of properties greater than limit value	DM (2026) Maximum Modelled Concentration	30.3	25.1	13.4
	DS1 (2026) Maximum Modelled Concentration	30.7	25.4	13.5
	Removed Exceedances	0	0	0
	New Exceedances	0	0	0
Total Number of Properties	Improvement in Concentration	1,048	1,015	716
	No Change in Concentration	1,512	2,793	5,070

		Construction Scenario DS1 2026		
Pollutant		**NO_2**	**PM_{10}**	**$PM_{2.5}$**
Annual Mean Limit Value ($\mu g/m^3$)		**40**	**40**	**25**
	Deterioration in Concentration	5,057	3,809	1,831
Do Something-Do Minimum Annual Mean Change ($\mu g/m^3$)	Maximum Improvement	-1.9	-1.1	-0.3
	Maximum Deterioration	1.7	1.0	0.4

1.4.1.38. The summary results in Table 22 show that there is a predicted deterioration in the highest concentration for all modelled pollutants at receptors within Verification Zone 5 under the DS1 scenario. The maximum predicted NO_2 concentration of 30.7 µg/m^3 is under the objective.

1.4.1.39. For NO_2 and PM_{10} the majority of receptors in Verification Zone 5 are predicted to experience a deterioration in concentrations, whilst for $PM_{2.5}$ the majority are predicted to experience no change. Overall, the predicted magnitude of maximum improvement is greater than the maximum deterioration, except for $PM_{2.5}$ where the predicted magnitude of maximum deterioration is greater.

1.4.1.40. Representative NO_2 concentrations for specific receptors are presented in response to the EHO for Havant:

- At No. 2 Bedhampton Hill, Havant, representative of concentrations in the Portsdown Hill area of Havant, an NO_2 concentration of 23.5 µg/m³ is predicted, which represents an increase of 0.5 µg/m³;
- At No. 262 Stakes Hill Road, Havant, representative of the Stakes Hill area, an NO_2 concentration of 17.7 µg/m³ is predicted, which represents an increase of 0.8 µg/m³;
- At No. 32 Hurstville Drive, Havant, representative of the Hurstville area, an NO_2 concentration of 15.9 µg/m³ is predicted, which represents an increase of 1.5 µg/m³; and
- At No. 54. Westbrook Grove, Havant, representative of the Aldermoor area, an NO_2 concentration of 13.7 µg/m³ is predicted, which represents an increase of 0.7 µg/m³.

1.4.1.41. A summary of the results for diversions and road closures for the DS2 scenario are shown in Table 23.

Table 23 - Non-construction Related Traffic Assessment Results for the Do-Something Scenario 2 (2026) for Verification Zone 5

	Construction Scenario DS2 2026		
Pollutant	**NO_2**	**PM_{10}**	**$PM_{2.5}$**
Annual Mean Limit Value (µg/m³)	**40**	**40**	**25**

Number of properties greater than limit value	DM (2026) Maximum Modelled Concentration	30.3	25.1	13.4
	DS2 (2026) Maximum Modelled Concentration	30.6	25.3	13.5
	Removed Exceedances	0	0	0
	New Exceedances	0	0	0
Total Number of Properties	Improvement in Concentration	1,052	1,021	716
	No Change in Concentration	1,533	2,772	5,065
	Deterioration in Concentration	5,032	3,824	1,836
Do Something-Do Minimum Annual Mean Change (µg/m³)	Maximum Improvement	-2.0	-1.1	-0.3
	Maximum Deterioration	1.7	1.0	0.4

1.4.1.42. The summary results in Table 23 show that there is a predicted deterioration in the highest concentration for all modelled pollutants at receptors within Verification Zone 5 under the DS2 scenario. The maximum predicted NO_2 concentration of 30.6 µg/m^3 is under the objective.

1.4.1.43. For NO_2 and PM_{10} a larger number of receptors are predicted to experience a deterioration in concentrations compared to those experiencing no change or an improvement, except for $PM_{2.5}$ where are larger number of receptors are predicted to experience no change. The maximum predicted improvements in concentrations of all modelled pollutants is greater than the maximum predicted deterioration.

1.4.1.44. Representative NO_2 concentrations for specific receptors are presented in response to the EHO for Havant:

- At No. 2 Bedhampton Hill, Havant, representative of concentrations in the Portsdown Hill area of Havant, an NO2 concentration of 23.5 µg/m³ is predicted, which represents an increase of 0.5 µg/m³;
- At No. 262 Stakes Hill Road, Havant, representative of the Stakes Hill area, an NO2 concentration of 17.7 µg/m³ is predicted, which represents an increase of 0.8 µg/m³;
- At No. 32 Hurstville Drive, Havant, representative of the Hurstville area, an NO2 concentration of 15.9 µg/m³ is predicted, which represents an increase of 1.5 µg/m³; and
- At No. 54. Westbrook Grove, Havant, representative of the Aldermoor area, an NO2 concentration of 13.7 µg/m³ is predicted, which represents an increase of 0.7 µg/m³.

Verification Zone 6

1.4.1.45. Within Verification Zone 6, the number of impacted receptors is shown in Table 24.

Table 24 - Impacted Receptors in Verification Zone 6

Type	Receptor Count
Residential	4,004
Commercial	445
Community	22
Military	2
Total Number of Receptors	**4,473**

1.4.1.46. Within the numbers of receptors shown in Table 24, there are receptors with particular sensitivity, as shown in Table 25.

Table 25 - Particularly Sensitive Receptors in Verification Zone 6

Sensitive Receptor	Receptor Count
Schools	9
Medical	1
Hospice	0
Sheltered Accommodation	0
Care Home	6

1.4.1.47. During the construction stage a summary of the results for road closure and diversion traffic for the DS1 scenario are shown in Table 26.

Table 26 - Non-construction Related Traffic Assessment Results for the Do-Something Scenario 1 (2026) for Verification Zone 6

		Construction Scenario DS1 2026		
Pollutant		**NO_2**	**PM_{10}**	**$PM_{2.5}$**
Annual Mean Limit Value (µg/m³)		**40**	**40**	**25**
Number of properties greater than limit value	DM (2026) Maximum Modelled Concentration	**40.9**	31.0	15.8
	DS1 (2026) Maximum Modelled Concentration	**40.2**	31.1	15.8
	Removed Exceedances	0	0	0
	New Exceedances	0	0	0
Total Number of Properties	Improvement in Concentration	1,908	72	81
	No Change in Concentration	2,553	4,168	4,236

		Construction Scenario DS1 2026		
Pollutant		**NO_2**	**PM_{10}**	**$PM_{2.5}$**
Annual Mean Limit Value (µg/m³)		**40**	**40**	**25**
	Deterioration in Concentration	12	233	156
Do Something-Do Minimum Annual Mean Change (µg/m³)	Maximum Improvement	-0.8	-0.2	-0.1
	Maximum Deterioration	0.1	0.1	0.1

1.4.1.48. The summary results in Table 26 predict and exceedance under the Do-Minimum scenario which is predicted to improve by 0.7µg/m³ in the highest predicted concentration at receptors within Verification Zone 6 for NO_2 in the DS1 scenario. This is a slight beneficial impact using the IAQM descriptors, and should be read in conjunction with the information on verification and model error in Section 1.4.3, considering that it was decided not to use the model correction factors in this zone due to a large increase in the model error. There is negligible improvement in the highest predicted concentrations for PM_{10} and no change for $PM_{2.5}$.

1.4.1.49. For NO_2, PM_{10} and $PM_{2.5}$, concentrations are not predicted to change at the majority of the receptors assessed for the DS1 scenario. For NO_2 a greater number of receptors are predicted to experience an improvement compared to those predicted to experience a deterioration, whilst for PM_{10} and $PM_{2.5}$ a greater number are predicted to experience a deterioration.

1.4.1.50. A summary of the results for diversions and road closures for the DS2 scenario are 27.

Table 27 - Non-construction Related Traffic Assessment Results for the Do-Something Scenario 2 (2026) for Verification Zone 6

		Construction Scenario DS2 2026		
Pollutant		**NO_2**	**PM_{10}**	**$PM_{2.5}$**
Annual Mean Limit Value (µg/m³)		**40**	**40**	**25**
	DM (2026) Maximum	**40.9**	31.0	15.8

		Construction Scenario DS2 2026		
Pollutant		**NO_2**	**PM_{10}**	**$PM_{2.5}$**
Annual Mean Limit Value (µg/m³)		**40**	**40**	**25**
Number of properties greater than limit value	Modelled Concentration			
	DS2 (2026) Maximum Modelled Concentration	**40.2**	31.0	15.8
	Removed Exceedances	0	0	0
	New Exceedances	0	0	0
Total Number of Properties	Improvement in Concentration	1,857	71	6
	No Change in Concentration	2,584	4,184	4,437
	Deterioration in Concentration	32	218	30
Do Something-Do Minimum Annual Mean Change (µg/m³)	Maximum Improvement	-0.9	-0.1	-0.1
	Maximum Deterioration	0.1	0.1	0.1

1.4.1.51. The summary results in Table 27 predict and exceedance under the Do-Minimum scenario which is predicted to improve by 0.7µg/m^3 in the highest predicted concentration at receptors within Verification Zone 6 for NO_2 in the DS1 scenario. This is a slight beneficial impact using the IAQM descriptors, and should be read in conjunction with the information on verification and model error in Section 1.4.3, considering that it was decided not to use the model correction factors in this zone due to a large increase in the model error. There is negligible improvement in the highest predicted concentrations for PM_{10} and no change for $PM_{2.5}$.

1.4.1.52. For NO_2, PM_{10} and $PM_{2.5}$, concentrations are not predicted to change at the majority of the receptors assessed for the DS1 scenario. For NO_2 a greater number of receptors are predicted to experience an improvement compared to those predicted

to experience a deterioration, whilst for PM_{10} and $PM_{2.5}$ a greater number are predicted to experience a deterioration.

Air Quality Management Areas

1.4.1.53. Within the City of Portsmouth, the combined number of impacted receptors affected by roads intersecting the city's AQMAs are shown in Table 28.

Table 28 - Impacted Receptors affected by AQMAs

Type	Receptor Count
Residential	14,515
Commercial	1,150
Community	89
Military	1
Total Number of Receptors	**15,755**

1.4.1.54. Within the numbers of receptors shown in Table 28, there are receptors with particular sensitivity, as shown in Table 29.

Table 29 - Particularly Sensitive Receptors affected by AQMAs

Sensitive Receptor	Receptor Count
Schools	37
Medical	17
Hospice	0
Sheltered Accommodation	1
Care Home	42

1.4.1.55. During the construction stage a summary of the results for road closure and diversion traffic for the DS1 scenario are shown in Table 30.

Table 30 - Non-construction Related Traffic Assessment Results for the Do-Something Scenario 1 (2026) for AQMAs

		Construction Scenario DS1 2026		
Pollutant		**NO_2**	**PM_{10}**	**$PM_{2.5}$**
Annual Mean Limit Value (µg/m³)		**40**	**40**	**25**
Number of properties greater than limit value	DM (2026) Maximum Modelled Concentration	39.7	23.0	14.0
	DS1 (2026) Maximum Modelled Concentration	39.2	23.0	14.1
	Removed Exceedances	0	0	0
	New Exceedances	0	0	0
Total Number of Properties	Improvement in Concentration	3,514	1,662	325
	No Change in Concentration	8,267	11,038	15,022
	Deterioration in Concentration	3,974	3,055	408
Do Something-Do Minimum Annual Mean Change (µg/m³)	Maximum Improvement	-0.8	-0.3	-0.1
	Maximum Deterioration	0.1	0.2	0.1

1.4.1.56. The summary results in Table 30 show that there is an improvement of 0.8 µg/m³ in the highest predicted concentration at receptors within Verification Zone 2 for NO_2 in the DS1 scenario. The maximum DS1 concentration of 39.2 µg/m³ is just under the objective. There is no change in the highest predicted concentrations for PM_{10}, and a negligible deterioration of 0.1 µg/m³ in the maximum predicted concentration of $PM_{2.5}$.

1.4.1.57. For NO_2, PM_{10} and $PM_{2.5}$, concentrations are not predicted to change at the majority

of the receptors assessed for the DS1 scenario. For all modelled pollutants more receptor are predicted to experience a deterioration than an improvement in concentrations. Overall, the level of maximum improvement is greater than the maximum deterioration, except for $PM_{2.5}$ where they are equal.

1.4.1.58. A summary of the results for diversions and road closures for the DS2 scenario are shown in Table 31.

Table 31 - Non-construction Related Traffic Assessment Results for the Do-Something Scenario 2 (2026) for AQMAs

		Construction Scenario DS2 2026		
Pollutant		**NO_2**	**PM_{10}**	**$PM_{2.5}$**
Annual Mean Limit Value (µg/m³)		**40**	**40**	**25**
Number of properties greater than limit value	DM (2026) Maximum Modelled Concentration	39.7	23.0	14.0
	DS2 (2026) Maximum Modelled Concentration	39.2	23.0	14.1
	Removed Exceedances	0	0	0
	New Exceedances	0	0	0
Total Number of Properties	Improvement in Concentration	3,600	510	23
	No Change in Concentration	11,708	13,392	15,504
	Deterioration in Concentration	447	1853	228
Do Something-Do Minimum	Maximum Improvement	-0.5	-0.1	-0.1

		Construction Scenario DS2 2026		
Pollutant		**NO_2**	**PM_{10}**	**$PM_{2.5}$**
Annual Mean Limit Value (µg/m³)		**40**	**40**	**25**
Annual Mean Change (µg/m³)	Maximum Deterioration	0.1	0.1	0.1

1.4.1.59. The summary results in Table 31 show that there is an improvement of 0.5 µg/m^3 in the highest predicted concentration at receptors within Verification Zone 2 for NO_2 in the DS1 scenario. The maximum DS1 concentration of 39.2 µg/m^3 is just under the objective. There is no change in the highest predicted concentrations for PM_{10}, and a negligible deterioration of 0.1 µg/m³ in the maximum predicted concentration of $PM_{2.5}$.

1.4.1.60. For all modelled pollutants, concentrations are not predicted to change at the vast majority of receptors assessed for the DS2 scenario. The maximum predicted improvement in concentrations of NO_2 is greater than the maximum predicted deterioration, however for particulate matter the maximum predicted deterioration and maximum predicted improvement are equal.

1.4.2. CONSTRUCTION TRAFFIC

Construction Stage

Embedded Mitigation

1.4.2.1. Embedded mitigation is described in the Construction Traffic Management Plan (CTMP), and includes the following:

- Temporary traffic signals to be used where lane closures or partial carriageway closure is required. during peak times the signals will be manually adjusted to ensure delays are kept to a minimum;
- Road closures may be required where the highway is of insufficient width to accommodate works and have traffic continue to flow at a safe distance. Where this is required diversion routes will be agreed with the local highways authority; and
- Construction hours will be scheduled to avoid peak times, especially where schools are in the immediate vicinity of works, and to avoid particular major scheduled events.

Impacts

1.4.2.2. A summary of the results for the effects of construction traffic under the DS1 scenario for the proposed development is shown in Table 32.

Table 32 - Construction Related Traffic Assessment Results for the Do-Something Scenario 1 (2026)

		Construction Scenario DS1 2026		
Pollutant		**NO_2**	**PM_{10}**	**$PM_{2.5}$**
Annual Mean Limit Value (µg/m³)		**40**	**40**	**25**
Number of properties greater than limit value	DM (2026) Maximum Modelled Concentration	25.3	22.5	12.6
	DS1 (2026) Maximum Modelled Concentration	25.2	19.1	12.4
	Removed Exceedances	0	0	0
	New Exceedances	0	0	0
Total Number of Properties	Improvement in Concentration	7,213	6,529	4,757
	No Change in Concentration	4,159	5,543	8,079
	Deterioration in Concentration	2,332	1,632	868
Do Something-Do Minimum Annual Mean Change (µg/m³)	Maximum Improvement	-5	-3.6	-1.1
	Maximum Deterioration	8.4	1.8	0.5

1.4.2.3. The results in Table 32 show predicted improvements in the maximum predicted concentration along the routes used by construction traffic. For all pollutants, a greater number of receptors are predicted to experience improvements in concentrations than those experiencing a deterioration, however in the case the maximum change for NO_2 the predicted deterioration is greater than the predicted improvement.

1.4.2.4. 1A summary of the predictions for changes in predicted concentrations resulting from the operation of construction traffic under the DS2 scenario is shown in Table 33.

Table 33 - Construction Related Traffic Assessment Results for the Do-Something Scenario 2 (2026)

		Construction Scenario DS2 2026		
Pollutant		**NO_2**	**PM_{10}**	**$PM_{2.5}$**
Annual Mean Limit Value (µg/m³)		**40**	**40**	**25**
Number of properties greater than limit value	DM (2026) Maximum Modelled Concentration	25.3	22.5	12.6
	DS2 (2026) Maximum Modelled Concentration	22.1	18.0	12.4
	Removed Exceedances	0	0	0
	New Exceedances	0	0	0
Total Number of Properties	Improvement in Concentration	12,493	11,534	8,652
	No Change in Concentration	1,015	2,009	4,812
	Deterioration in Concentration	196	161	240
Do Something-Do Minimum Annual Mean Change (µg/m³)	Maximum Improvement	-6.9	-4.9	-1.5
	Maximum Deterioration	5.7	0.8	0.2

1.4.2.5. The summary results in Table 33 show that the maximum predicted concentrations are lower than the Do-Minimum scenario, and lower than the DS1 scenario. The majority of receptors are predicted to experience improvements in the concentrations of all pollutants, with the magnitude of predicted improvements greater than the magnitude of predicted deteriorations.

Verification Zone 1

1.4.2.6. The results for verification Zone 1 are shown in Table 34.

Table 34 - Zone 1 Diffusion Tube Verification and Adjustment Factor Derivation

Site ID	Total B/G NO_2	Monitored Total NO_2	% Diff.	Monitored Total NO_x	Total B/G NO_x	Monitored Road Contribution NO_2	Monitored Road Contribution NO_x	Modelled Road NO_x	Ratio of Monitored Road to Modelled Road
PO1	22.0	42.9	36.4	79.8	34.3	20.9	45.6	16.0	0.4
PO3	22.0	24.1	-1.5	38.4	34.3	2.1	4.2	10.3	2.5
PO5	24.9	28.1	3.6	45.8	39.3	3.2	6.5	16.0	2.5
PO6	24.9	30.9	7.1	51.6	39.3	6.0	12.3	19.3	1.6
PO7	24.9	27.7	10.3	45.1	39.3	2.9	5.8	11.4	2.0
PO23	20.8	34.6	16.2	60.4	31.6	13.8	28.8	22.9	0.8
PO24	21.0	36.8	28.4	65.2	31.9	15.8	33.3	15.1	0.5
PO25	22.6	38.2	24.8	68.3	35.0	15.6	33.3	17.1	0.5
PO26	27.9	46.0	20.7	87.0	46.8	18.1	40.2	25.4	0.6
PO30	27.9	39.2	21.5	70.9	46.8	11.3	24.1	12.9	0.5
PO32	23.7	31.9	-2.6	54.1	37.3	8.2	16.8	25.8	1.5
PO34	23.7	33.3	1.4	57.3	37.3	9.6	20.0	26.2	1.3

Site ID	Total B/G NO_2	Monitored Total NO_2	% Diff.	Monitored Total NO_x	Total B/G NO_x	Monitored Road Contribution NO_2	Monitored Road Contribution NO_x	Modelled Road NO_x	Ratio of Monitored Road to Modelled Road
PO35	22.0	30.1	14.5	50.7	34.3	8.1	16.4	12.8	0.8
PO37	24.9	40.6	22.4	73.1	39.3	15.7	33.8	25.5	0.8
PO40	27.9	34.0	-11.5	59.4	46.8	6.1	12.6	28.4	2.3
PO42	27.9	38.0	8.1	68.4	46.8	10.2	21.6	22.0	1.0
PO43	27.9	32.5	0.6	56.4	46.8	4.6	9.5	16.2	1.7
PO48	24.9	30.5	20.6	50.9	39.3	5.7	11.6	10.2	0.9
PO53	23.9	30.5	0.6	51.8	38.3	6.7	13.6	16.9	1.2
PO56	22.0	35.1	42.8	61.6	34.3	13.1	27.3	1.5	0.1
PO58	22.0	29.3	29.9	49.1	34.3	7.3	14.8	2.4	0.2
PO86	20.4	28.9	28.9	47.9	30.7	8.5	17.2	6.6	0.4
PO87	20.4	27.3	20.4	44.6	30.7	6.9	13.9	8.9	0.6
	Defra Background maps	LA Diffusion tube data	LAQM.TG(09)	NOx to NO2 calculator	Defra Background maps	Derived (LAQM.TG(09))	Derived (LAQM.TG(09))	ADMS-roads output	Derived (LAQM.TG(09))

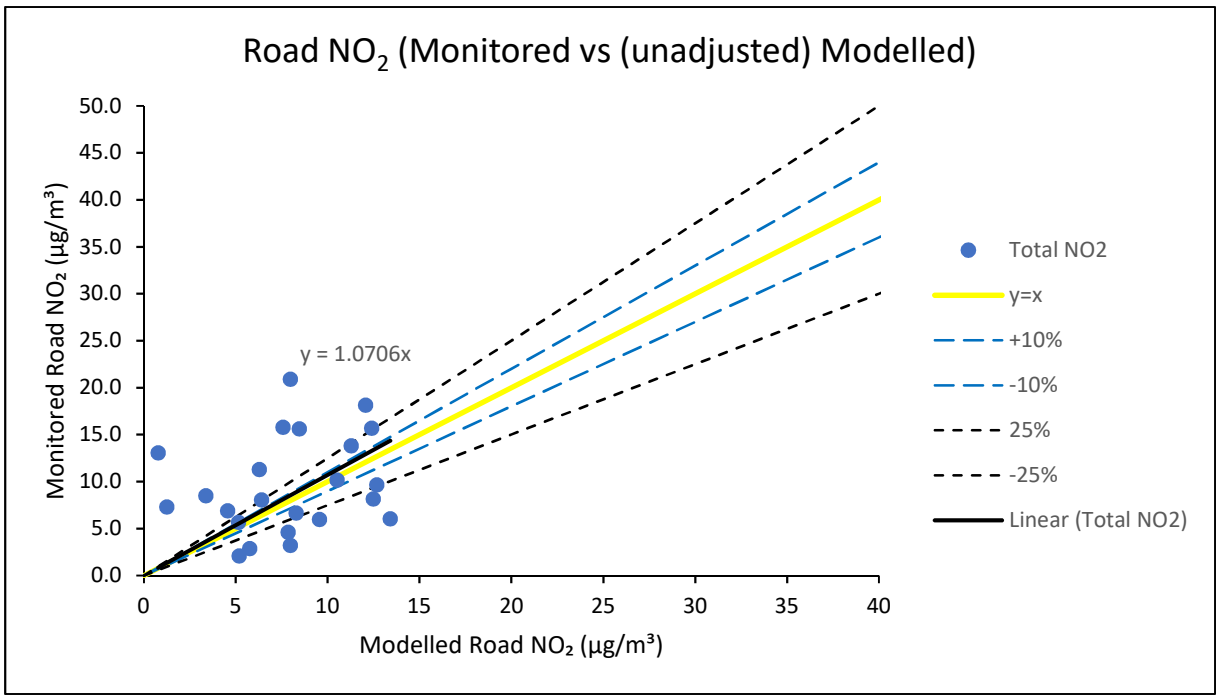

Plate 2 - Zone 1 Graph of Monitored NO_2 against Modelled NO_2 before Adjustment

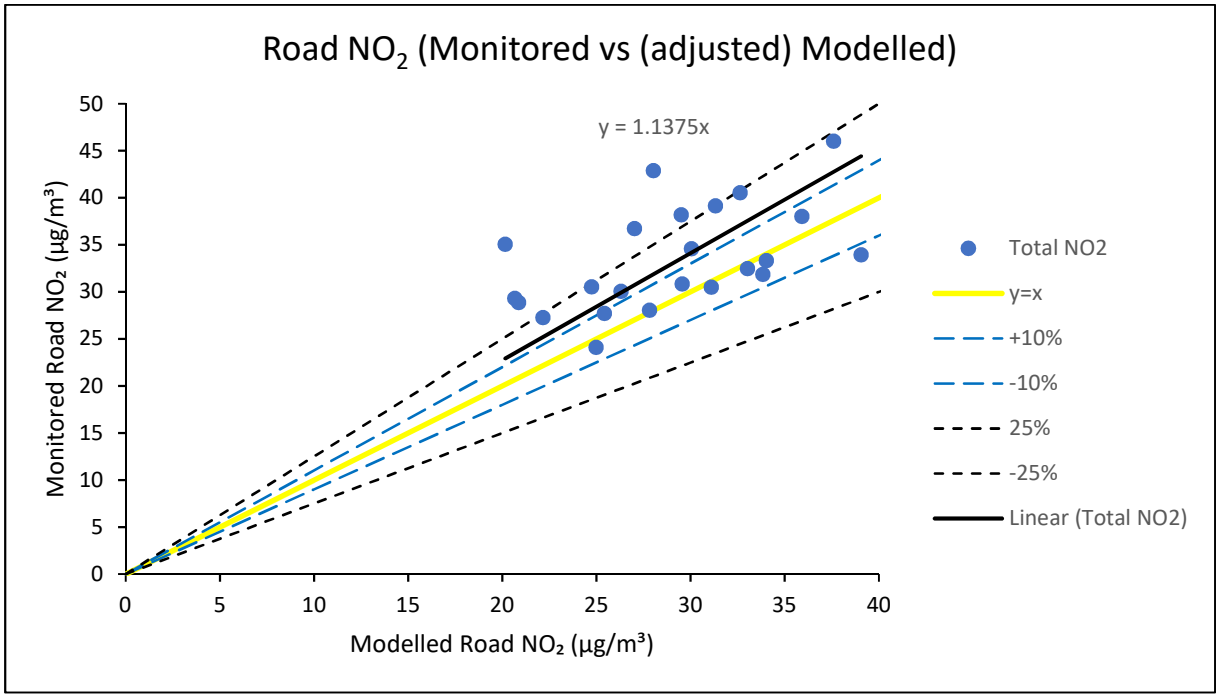

Plate 3 - Zone 1 Graph of Monitored NO_2 against Modelled NO_2 after Adjustment

1.4.2.7. An adjustment factor of 1.10 was applied to the model for this verification zone. Plate 2 shows the relationship between monitored and modelled NO_2 with the best-fit line gradient of 1.07x. Following application of the adjustment factor, the relationship was improved as shown in Plate 3, with the best-fit line achieving a gradient of 1.14x. Whilst is not an improvement in the direct relationship, it beings a greater number of results to within 25% correlation.

1.4.2.8. The performance of the model is summarised in Table 35.

Table 35 – Zone 1 Model Performance

Statistic	Results before verification and adjustment	Results after verification and adjustment	Comments
RMSE (µg/m³)	7.28	6.88	Model marginally under-predicts after adjustment
Correlation	0.56	0.52	
Fractional Bias	0.17	0.15	

1.4.2.9. Table 35 shows that the Root Mean Squared Error of 7.28 µg/m³ is reduced marginally to 6.88 µg/m³. The Fractional Bias shows that the model produces very small under predictions.

Verification Zone 2

1.4.2.10. The results for verification Zone 1 are shown in Table 36.

Table 36 - Zone 2 Diffusion Tube Verification and Adjustment Factor Derivation

Site ID	Total B/G NO_2	Monitored Total NO_2	% Diff.	Monitored Total NO_x	Total B/G NO_x	Monitored Road Contribution NO_2	Monitored Road Contribution NO_x	Modelled Road NO_x	Ratio of Monitored Road to Modelled Road
PO15	19.6	27.6	3.6	45.5	29.4	8.0	16.1	17.9	1.1
PO18	19.6	26.0	-5.6	42.1	29.4	6.4	12.7	19.7	1.5
PO19	20.8	37.7	28.1	67.3	31.5	16.9	35.8	18.4	0.5
PO39	19.5	34.0	25.7	59.4	29.2	14.5	30.2	13.6	0.5
PO61	20.8	33.7	15.9	58.2	31.5	12.9	26.8	21.0	0.8
PO62	20.8	22.0	-1.8	33.9	31.5	1.3	2.5	8.8	3.6
PO63	20.8	34.2	17.5	59.3	31.5	13.4	27.9	20.7	0.7
PO65	20.8	28.2	12.9	46.5	31.5	7.5	15.1	13.2	0.9
PO66	20.8	31.9	23.4	54.3	31.5	11.1	22.9	12.9	0.6
PO67	20.8	36.7	28.5	65.1	31.5	16.0	33.7	16.7	0.5
PO68	20.8	36.9	27.1	65.4	31.5	16.1	34.0	17.9	0.5
PO76	19.5	31.3	16.7	53.3	29.2	11.8	24.1	15.2	0.6

Site ID	Total B/G NO_2	Monitored Total NO_2	% Diff.	Monitored Total NO_x	Total B/G NO_x	Monitored Road Contribution NO_2	Monitored Road Contribution NO_x	Modelled Road NO_x	Ratio of Monitored Road to Modelled Road
PO77	19.5	21.2	-12.3	32.6	29.2	1.7	3.4	10.7	3.1
PO78	19.5	25.0	32.6	40.0	29.0	5.6	11.1	1.6	0.1
PO90	20.8	24.0	8.0	37.8	31.5	3.2	6.3	8.1	1.3
PO91	20.8	26.7	17.4	43.3	31.5	5.9	11.8	8.0	0.7
PO92	19.5	27.3	34.5	44.6	29.0	7.8	15.7	3.5	0.2
	Defra Background maps	LA Diffusion tube data	LAQM.TG(09)	NOx to NO2 calculator	Defra Background maps	Derived (LAQM.TG(09))	Derived (LAQM.TG(09))	ADMS-roads output	Derived (LAQM.TG(09))

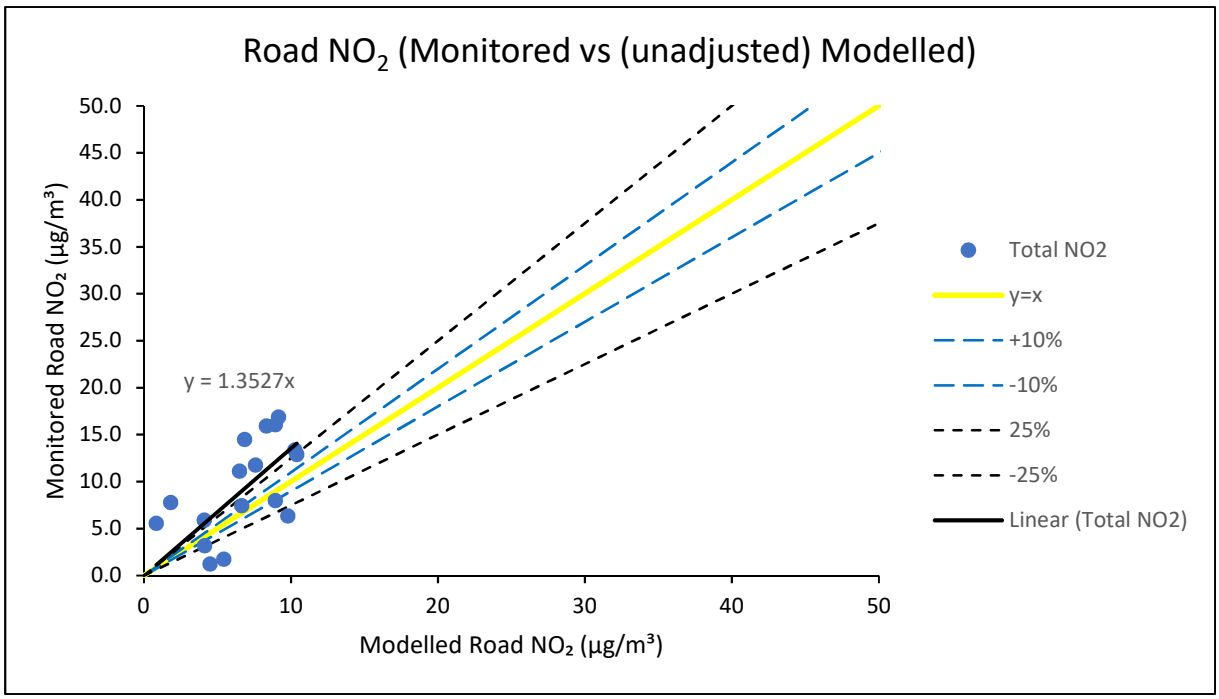

Plate 4 - Zone 2 Graph of Monitored NO_2 against Modelled NO_2 before Adjustment

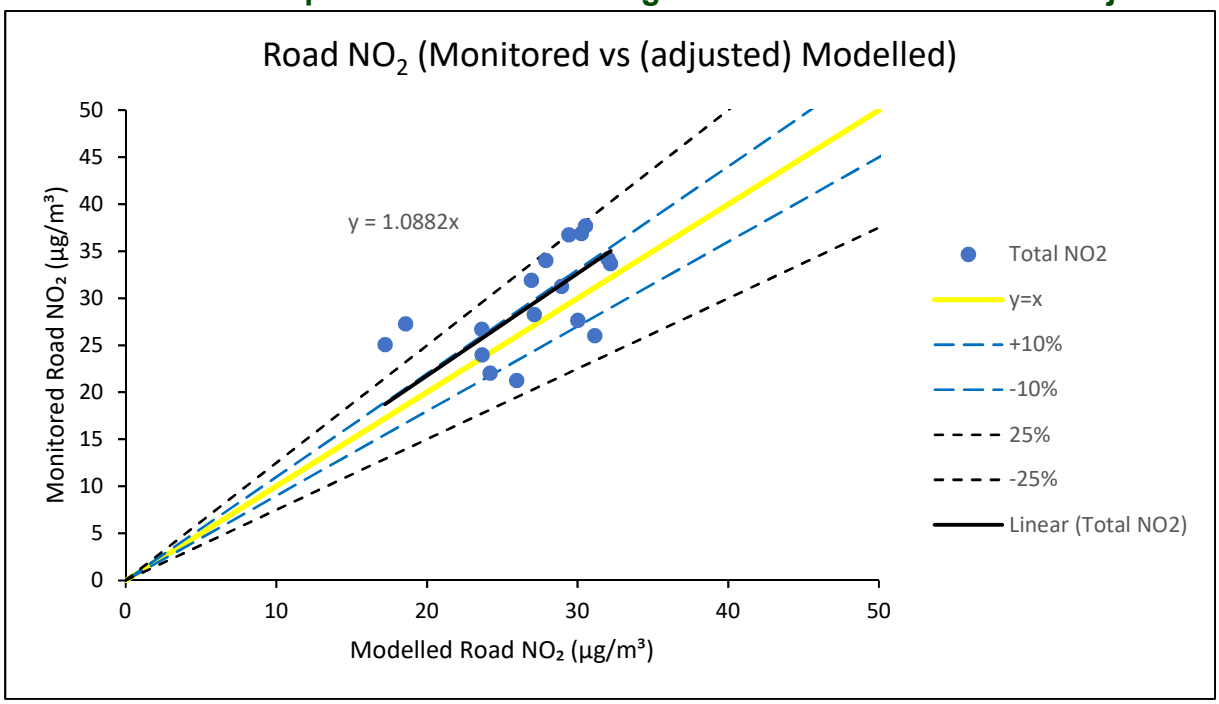

Plate 5 - Zone 2 Graph of Monitored NO_2 against Modelled NO_2 after Adjustment

1.4.2.11. An adjustment factor of 1.4 was applied for verification Zone 2. Plate 4 shows the relationship between monitored and modelled NO_2 with the best-fit line gradient of 1.35x. Following application of the adjustment factor, the relationship was improved as shown in Plate 3, with the best-fit line achieving a gradient of 1.09x. This is an improvement in the direct relationship between modelled and monitored total NO_2, and brings the majority of results within 25 %.

1.4.2.12. The performance of the model is summarised in Table 37.

Table 37 - Zone 2 Model Performance

Statistic	Results before verification and adjustment	Results after verification and adjustment	Comments
RMSE (µg/m³)	6.64	5.02	Model marginally under-predicts after adjustment
Correlation	0.59	0.60	
Fractional Bias	0.19	0.09	

1.4.2.13. Table 37 shows a reduction of 1.62 µg/m³ in the model error. The correlation coefficient improves by 0.01, which cannot be considered statistically significant, however the 0.1 improvement of the fractional bias means the rate of under-prediction is slightly reduced by model correction.

Verification Zone 3

1.4.2.14. The results for verification Zone 3 are shown in Table 38.

Table 38 - Zone 3 Diffusion Tube Verification and Adjustment Factor Derivation

Site ID	Total B/G NO_2	Monitored Total NO_2	% Diff.	Monitored Total NO_x	Total B/G NO_x	Monitored Road Contribution NO_2	Monitored Road Contribution NO_x	Modelled Road NO_x	Ratio of Monitored Road to Modelled Road
PO16	24.3	29.6	-5.4	48.2	37.4	5.3	10.8	28.3	2.6
	Defra Background maps	LA Diffusion tube data	LAQM.TG (09)	NOx to NO2 calculator	Defra Background maps	Derived (LAQM.TG(09))	Derived (LAQM.TG(09))	ADMS-roads output	Derived (LAQM.TG(09))

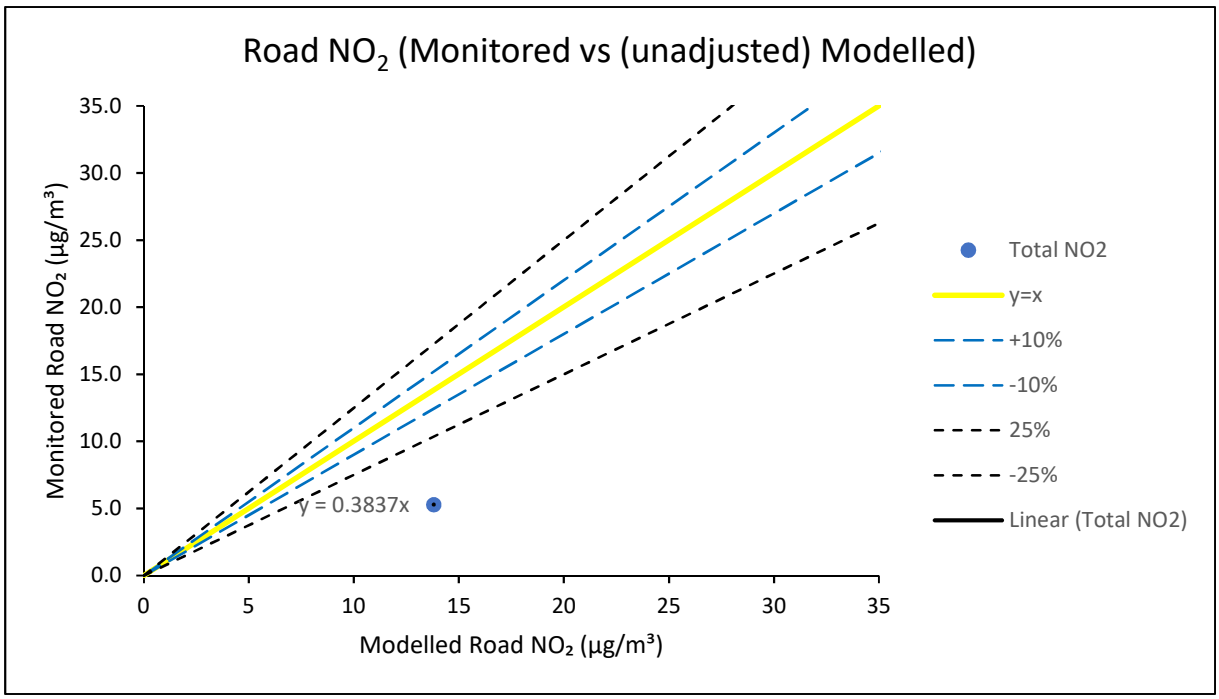

Plate 6 - Zone 3 Graph of Monitored NO_2 against Modelled NO_2 before Adjustment

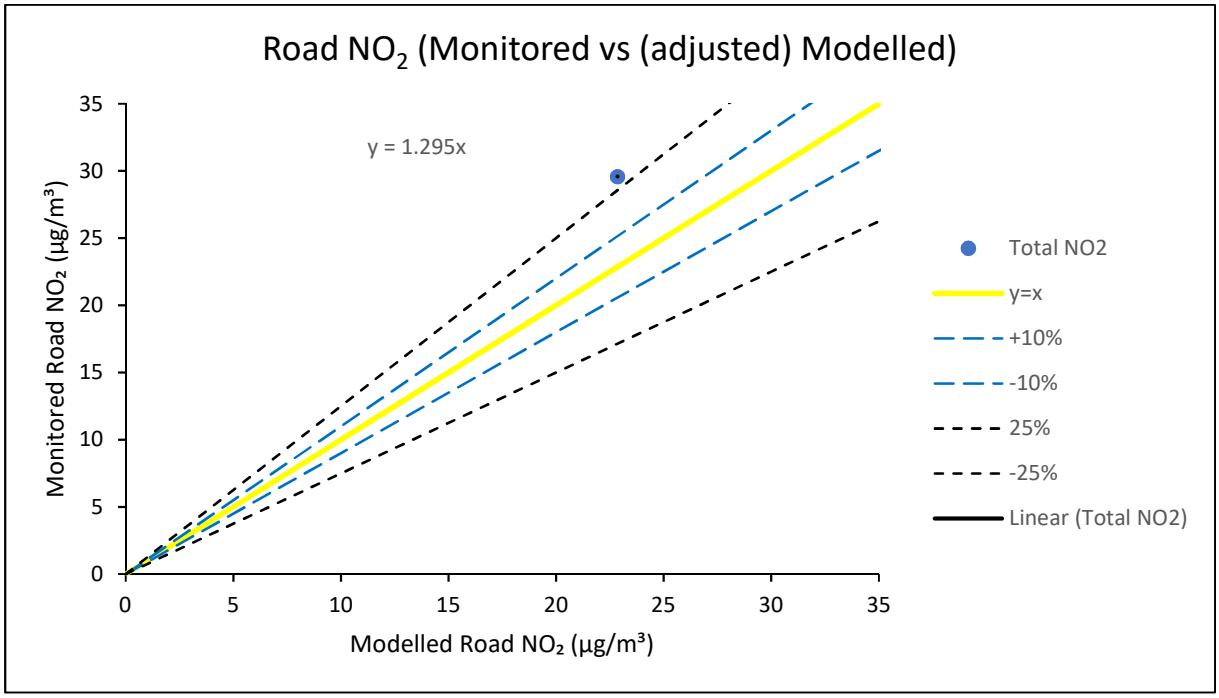

Plate 7 - Zone 3 Graph of Monitored NO_2 against Modelled NO_2 after Adjustment

1.4.2.15. An adjustment factor of 0.38 was applied for this verification zone. Plate 6 shows the relationship between monitored and modelled NO_2 with the best-fit line gradient of 0.38x. Following application of the adjustment factor, the relationship was improved as shown in Plate 7, with the best-fit line achieving a gradient of 1.3x. This brings the relationship between monitored and modelled NO_2 closer to the 25 % relationship.

1.4.2.16. The performance of the model is summarised in Table 39.

Table 39 - Zone 3 Model Performance

Statistic	Results before verification and adjustment	Results after verification and adjustment	Comments
RMSE (µg/m³)	1.59	6.74	Model marginally under-predicts after adjustment
Correlation	-	-	
Fractional Bias	-0.05	0.26	

1.4.2.17. Table 39 that despite an improvement in the relationship between monitored and modelled NO_2, there is a marked increase in the error in the model of 5.15 µg/m³. A correlation coefficient is not possible as this zone only uses a single diffusion tube monitoring point.

1.4.2.18. The fractional bias rate shows that the model moves from a slight over-prediction to a slight under-prediction.

1.4.2.19. Given the marked increase in the error following correction, the uncorrected model output was reported for this zone.

Verification Zone 4

1.4.2.20. The results for verification Zone 4 are shown in Table 40.

Table 40 - Zone 4 Diffusion Tube Verification and Adjustment Factor Derivation

Site ID	Total B/G NO_2	Monitored Total NO_2	% Diff.	Monitored Total NO_x	Total B/G NO_x	Monitored Road Contribution NO_2	Monitored Road Contribution NO_x	Modelled Road NO_x	Ratio of Monitored Road to Modelled Road
PO9	20.9	36.7	35.6	64.7	31.3	15.8	33.4	11.9	0.4
PO71	20.9	27.8	23.5	45.2	31.3	6.9	13.9	7.0	0.5
PO72	20.9	26.5	-13.3	42.5	31.3	5.6	11.3	25.3	2.2
PO73	20.9	27.4	0.0	44.4	31.3	6.5	13.2	19.6	1.5
PO75	20.9	25.7	18.6	40.9	31.3	4.9	9.7	6.4	0.7
	Defra Background maps	LA Diffusion tube data	LAQM.TG (09)	NOx to NO2 calculator	Defra Background maps	Derived (LAQM.TG(09))	Derived (LAQM.TG(09))	ADMS-roads output	Derived (LAQM.TG(09))

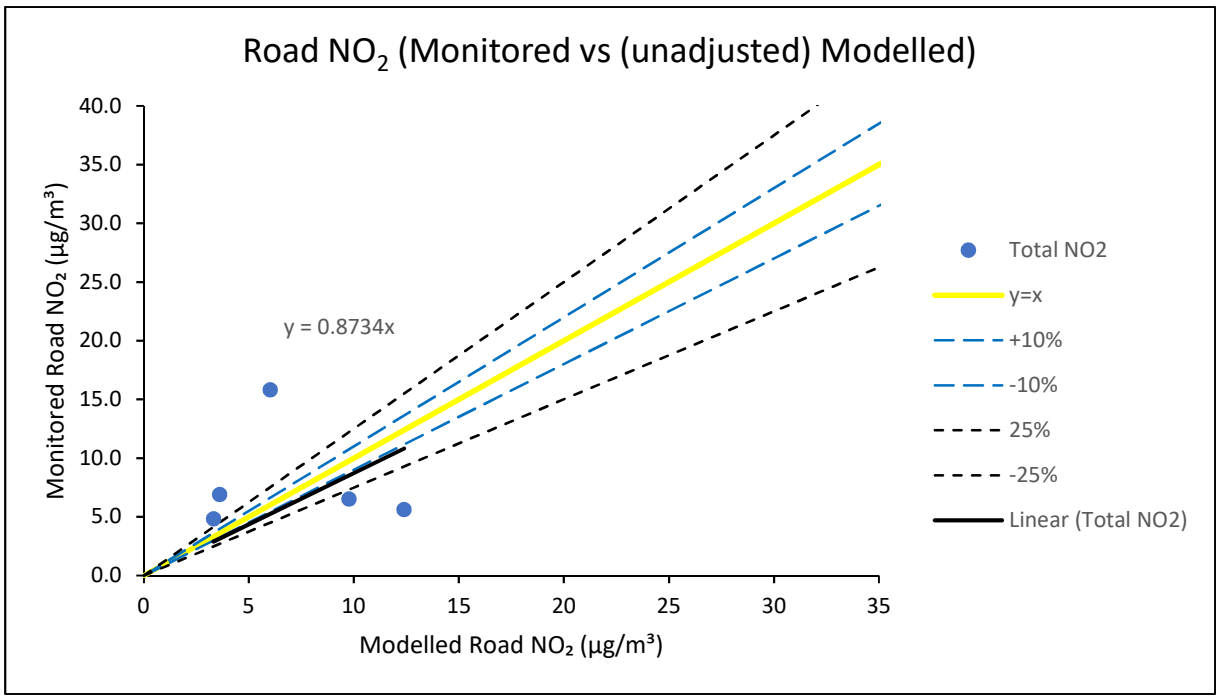

Plate 8 - Zone 4 Graph of Monitored NO_2 against Modelled NO_2 before Adjustment

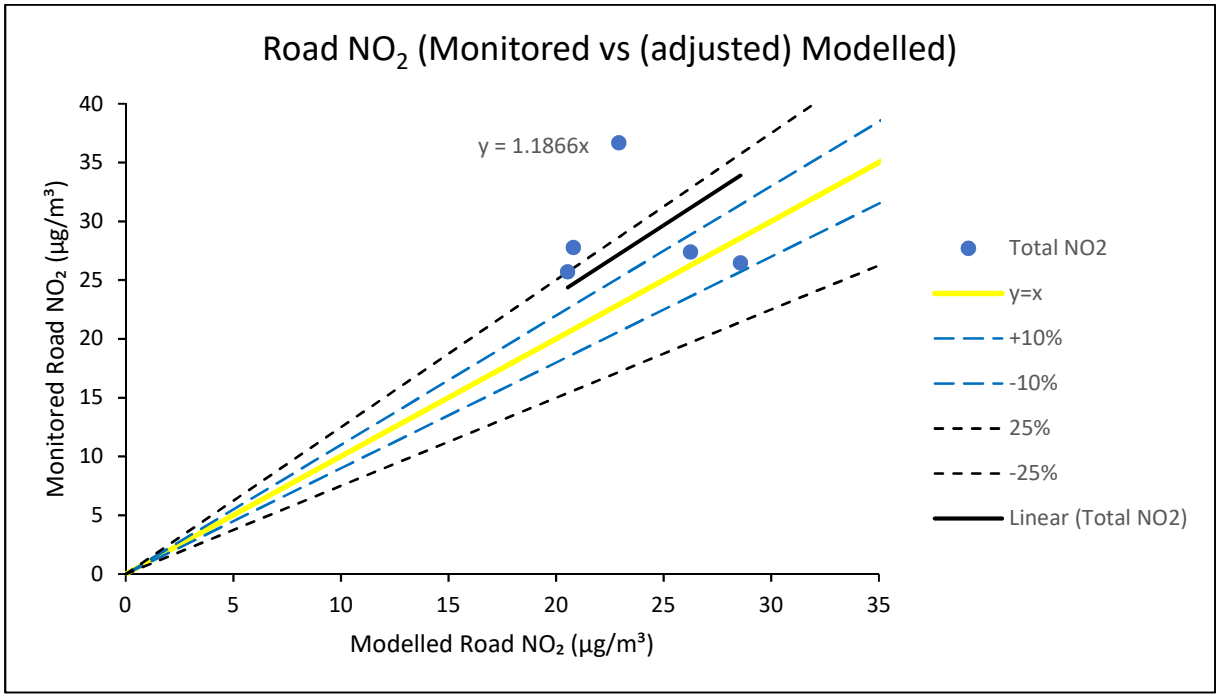

Plate 9 - Zone 4 Graph of Monitored NO_2 against Modelled NO_2 after Adjustment

1.4.2.21. An adjustment factor of 0.88 was applied for this verification zone. Plate 8 shows the relationship between monitored and modelled NO_2 with the best-fit line gradient of 0.87x. Following application of the adjustment factor, the relationship was changed to 1.19x as shown in Plate 9. Whilst not an improvement in the direct relationship, a larger number of points are brought within the 25 % relationship between monitored and modelled NO_2.

1.4.2.22. The performance of the model is summarised in Table 41.

Table 41 - Zone 4 Model Performance

Statistic	Results before verification and adjustment	Results after verification and adjustment	Comments
RMSE (µg/m³)	7.05	7.36	Model marginally under-predicts after adjustment
Correlation	0.13	0.13	
Fractional Bias	0.16	0.19	

1.4.2.23. Table 41 shows a slight increase in the model error of 0.31 µg/m³. The correlation coefficient improves is unchanged, and the fractional bias shows a slight increase in the tendency of the model to under-predict.

Verification Zone 5

1.4.2.24. The results for verification Zone 5 are shown in Table 42.

Table 42 - Zone 5 Diffusion Tube Verification and Adjustment Factor Derivation

Site ID	Total B/G NO_2	Monitored Total NO_2	% Diff.	Monitored Total NO_x	Total B/G NO_x	Monitored Road Contribution NO_2	Monitored Road Contribution NO_x	Modelled Road NO_x	Ratio of Monitored Road to Modelled Road
HA8	15.7	27.8	48.1	46.7	22.3	12.2	24.4	1.0	0.0
HA25 (B)	15.7	26.8	31.5	44.6	22.4	11.2	22.2	7.0	0.3
	Defra Background maps	LA Diffusion tube data	LAQM.TG(09)	NOx to NO2 calculator	Defra Background maps	Derived (LAQM.TG(09))	Derived (LAQM.TG(09))	ADMS-roads output	Derived (LAQM.TG(09))

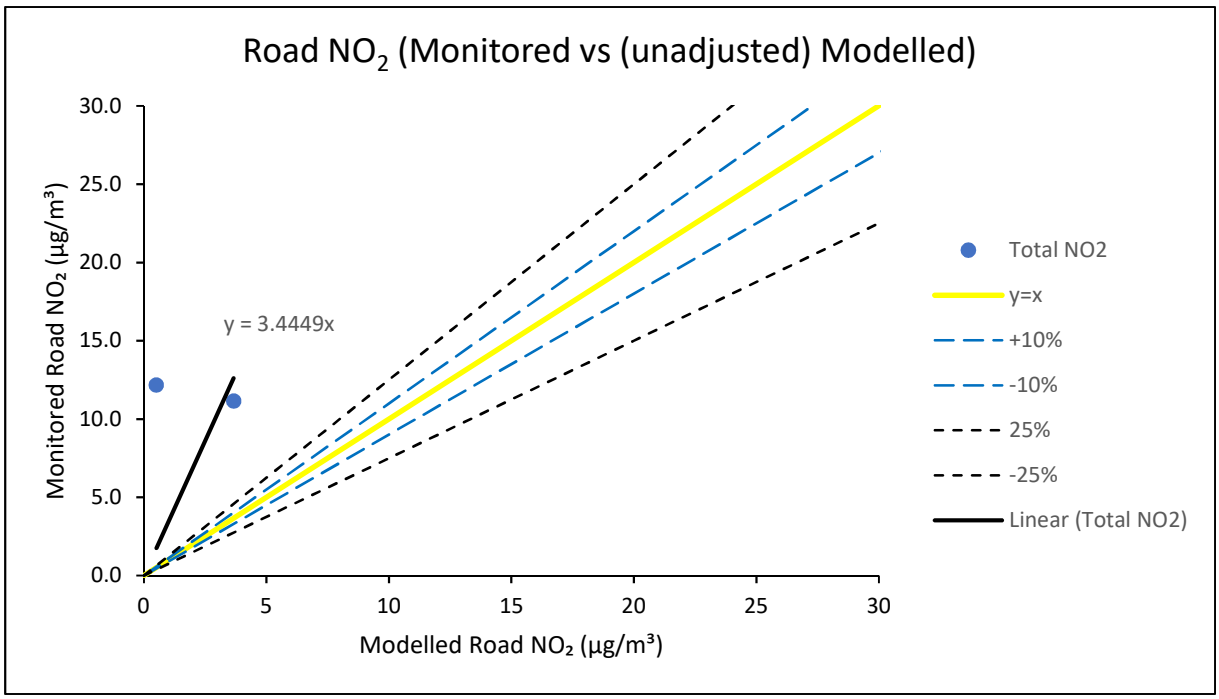

Plate 10 - Zone 5 Graph of Monitored NO_2 against Modelled NO_2 before Adjustment

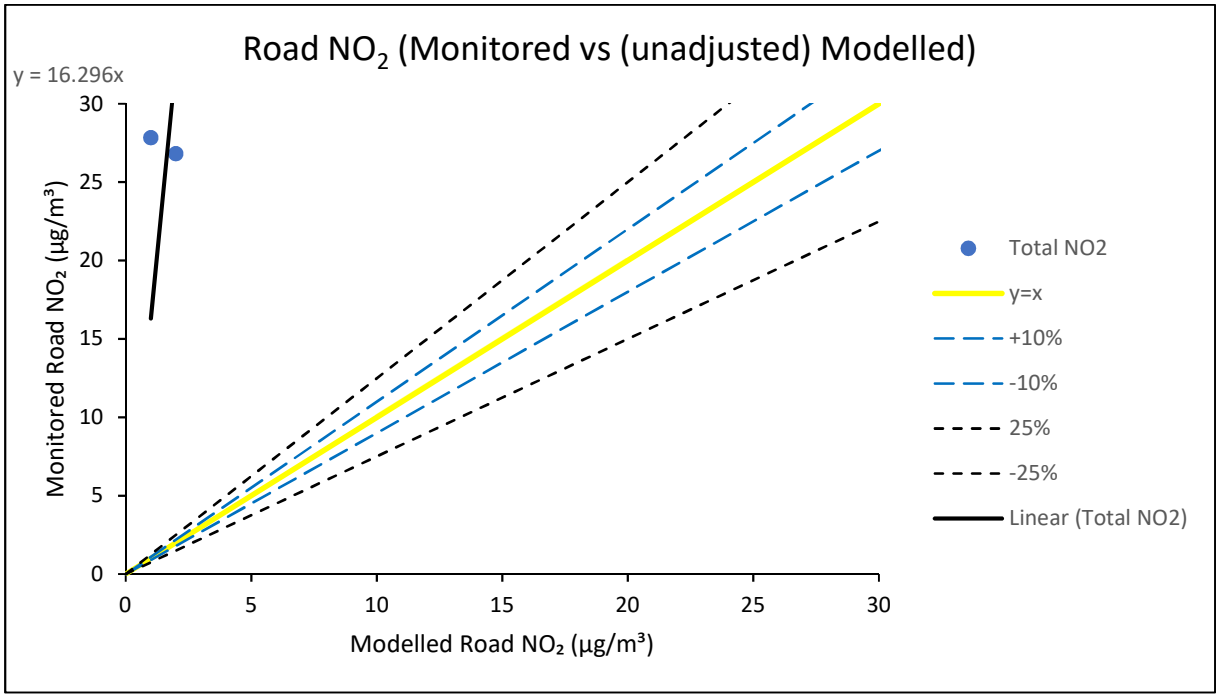

Plate 11 - Zone 5 Graph of Monitored NO_2 against Modelled NO_2 after Adjustment

1.4.2.25. An adjustment factor of 3.58 was applied for verification Zone 5. Plate 10 shows the relationship between monitored and modelled NO_2 with the best-fit line gradient of 0.87x. Following application of the adjustment factor, the relationship was changed to 1.19x as shown in Plate 11. Whilst not an improvement in the direct relationship, a larger number of points are brought within the 25 % relationship between monitored and modelled NO_2. The performance of the model is summarised in Table 43.

Table 43 - Zone 5 Model Performance

Statistic	Results before verification and adjustment	Results after verification and adjustment	Comments
RMSE (µg/m^3)	11.19	8.55	Model marginally under-predicts after adjustment
Correlation	1.0	1.0	
Fractional Bias	0.50	0.24	

1.4.2.26. Table 43 shows large improvement in the model error of 2.64 µg/m³. The correlation coefficient improves is unchanged at 1.0, and the fractional bias shows a slight reduction in the tendency of the model to under-predict.

Verification Zone 6

1.4.2.27. The results for verification Zone 6 are shown in Table 44.

Table 44 - Zone 6 Diffusion Tube Verification and Adjustment Factor Derivation

Site ID	Total B/G NO_2	Monitored Total NO_2	% Diff.	Monitored Total NO_x	Total B/G NO_x	Monitored Road Contribution NO_2	Monitored Road Contribution NO_x	Modelled Road NO_x	Ratio of Monitored Road to Modelled Road
HA10	15.8	21.4	15.4	33.2	22.4	5.6	10.8	9.8	0.9
PO8	24.8	26.0	-13.4	41.1	38.8	1.1	2.2	20.0	8.9
	Defra Background maps	LA Diffusion tube data	LAQM.TG(09)	NOx to NO2 calculator	Defra Background maps	Derived (LAQM.TG(09))	Derived (LAQM.TG(09))	ADMS-roads output	Derived (LAQM.TG(09))

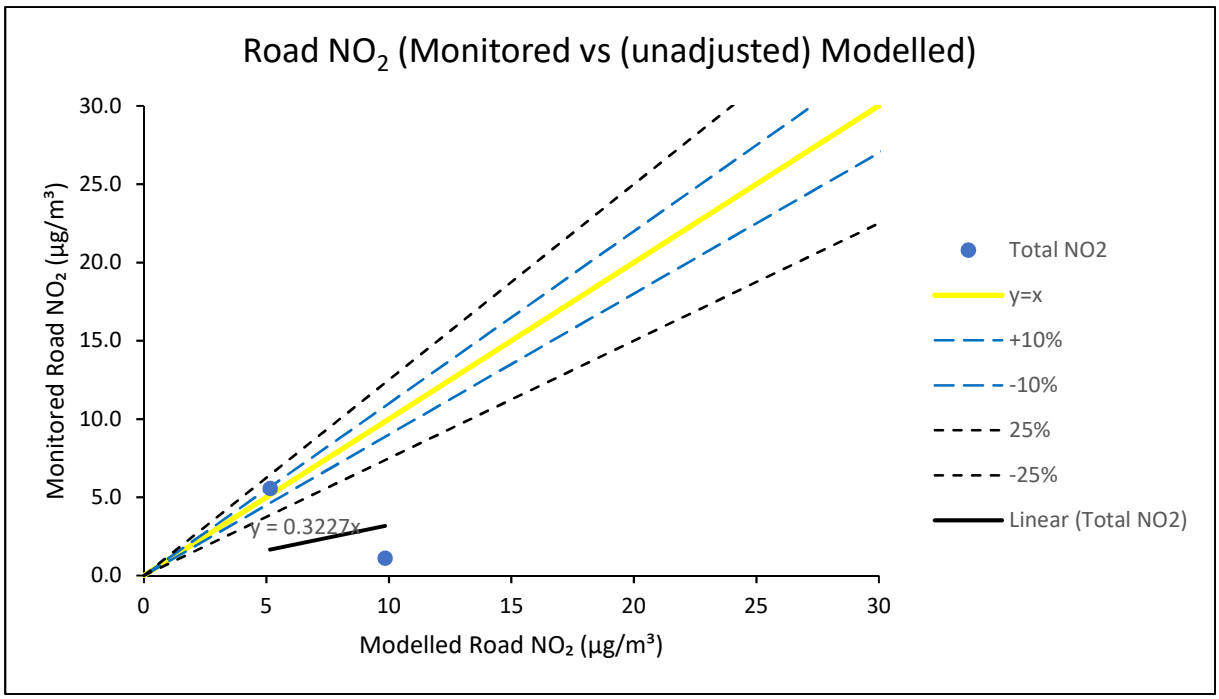

Plate 12 - Zone 6 Graph of Monitored NO_2 against Modelled NO_2 before Adjustment

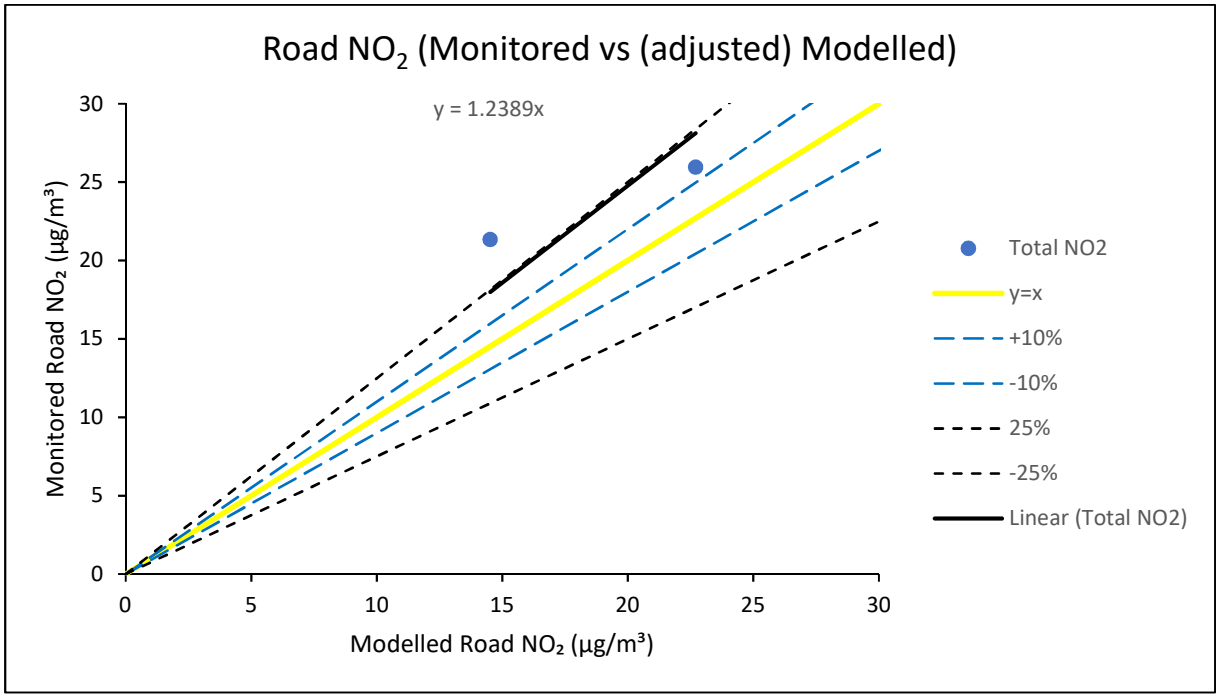

Plate 13 - Zone 6 Graph of Monitored NO_2 against Modelled NO_2 after Adjustment

1.4.2.28. An adjustment factor of 0.31 was applied for this verification zone. Plate 12 shows the relationship between monitored and modelled NO_2 with the best-fit line gradient of 0.32x. Following application of the adjustment factor, the relationship was improved to 1.24x as shown in Plate 13. The performance of the model is summarised in Table 45.

Table 45 - Zone 6 Model Performance

Statistic	Results before verification and adjustment	Results after verification and adjustment	Comments
RMSE (µg/m³)	3.38	5.36	Model marginally under-predicts after adjustment
Correlation	1	1	
Fractional Bias	0.00	0.24	

1.4.2.29. Table 45 shows an increase in the model error from 3.38 µg/m³ to 5.36 µg/m³. The correlation coefficient shows at 1:1 correlation, and the fractional bias shows a slight increase in the tendency of the model to under-predict.

1.4.2.30. Given the increase in the model error and the increase in the tendency of the model to under-predict, the correction factor was not applied to this verification zone and the uncorrected model output was reported.

1.4.3. VERIFICATION SUMMARY

1.4.3.1. The verification figures presented here are for the modelled pollutant predictions resulting from the ADMS-Roads output run without the complex canyon module. The results for the representative receptors from this arrangement were found to represent the worst-case predictions.

1.4.3.2. Verification for the assessment of Compliance with the EU Directive 2008/50/EC was undertaken using the predicted outputs from the ADMS-Roads model that included the complex canyon module. The verification factors are shown in Table 46 together with those run without the canyon module.

Table 46 - Comparison of Correction Factors With- and Without the Complex Canyon Module

Verification Zone	Factor with complex canyon module	Factor without complex canyon module
1	0.81	1.10
2	1.09	1.40
3	0.33	0.38

Verification Zone	Factor with complex canyon module	Factor without complex canyon module
4	0.83	0.88
5	2.80	3.58
6	0.31	0.31

1.4.3.3. None of the adjustment factors were found to be excessive, with the highest factor being 3.58 in Zone 5, however the RMSE model performance metric in the model for all verification zones (Table 35, Table 37, Table 39, Table 41, Table 43 and Table 45) was found to be consistently higher than the recommended 10 % of the objective value of 40 µg/m³, but within 25 % of the objective for the purposes of modelling (Department for Environment, Food and Rural Affairs, 2009).

1.4.3.4. It is the case that no project specific monitoring programme was undertaken for this project. Given the high volume of diffusion tubes covering the affected road network this was not considered to be necessary. However, these diffusion tubes are placed by local authorities on the basis of monitoring for Local Air Quality Management (LAQM) purposes, and are typically located in the areas of worst case exposure. This type of monitoring is not the most relevant type of monitoring that would be required for model verification but the assessment has used the data that was available. It has the capability to skew results due precisely to the objective of monitoring for the worst-case exposure, whereas monitoring for the purpose of model verification has the objective of looking for the most representative exposure over a larger area.

1.4.3.5. Table 47 provides a summary of the resulting RMSE for each zone and justification for the results presented.

Table 47 - Comparison of RMSE for each verification zone

Verification Zone	Before adjustment	After adjustment	Results reported	Justification
1	7.28	6.88	Adjusted	RMSE improvement
2	6.64	5.02	Adjusted	RMSE improvement
3	1.59	6.74	Unadjusted	RMSE deterioration

Verification Zone	Before adjustment	After adjustment	Results reported	Justification
4	7.05	7.36	Adjusted	RMSE improvement
5	11.19	8.55	Adjusted	RMSE improvement
6	3.38	5.36	Unadjusted	RMSE deterioration

1.4.3.6. The implications of the model performance metric data on the modelled predictions has been considered in the judgement of significance for the Proposed Development.

1.4.4. COMPLIANCE WITH DIRECTIVE 2008/50/EC

1.4.4.1. Due to the nature of the diversions, road closures and construction traffic operation, all of the predicted impacts are transitory in nature, and so are not predicted to impact on the ability of the Compliance Risk Road Network applicable to the proposed development to meet its obligations under EU Directive 2008/50/EC.

1.4.4.2. There is however, an area within the City of Portsmouth where the roadside concentration is predicted to be above the limit value for NO_2 of 40 µg/m³. The predicted concentration for 2026 at the roundabout of A3, Hope Street and Commercial Road is predicted to be 45.8 µg/m³ under the Do-Minimum and DS1 scenarios, and 44.9 µg/m³ under the DS2 scenario. The predicted 2026 compliance concentration for this area, adjusted using the Defra Roadside NO_2 Projection Factors (Department for Environment, Food and Rural Affairs, 2019), is 31.6 µg/m³.

1.4.4.3. The A3 between the roundabout with Hope Street and Commercial Street, up to the junction with Princess Royal Road is predicted to experience concentrations between 36 µg/m³ and 39 µg/m³, suggesting exceedances of the limit value may be possible taking into account error in the modelling, however due to the temporary nature of the diversions, the risk of exceedance is substantially reduced.

1.4.5. DECOMMISSIONING STAGE

1.4.5.1. Methodology and effects from decommissioning are expected to be of the same nature, magnitude and significance as for construction.

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