Air Quality Appendices 6.1 & 6.2	
Hamble Lane, Hampshire	
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A1.1. Road Traffic Model Inputs

Traffic Data

A1.1.1 The annual average daily traffic (AADT) flows and the vehicle fleet composition data have been provided by i-Transport, the Transport Consultants supporting the planning application for the scheme. It is anticipated that the proposed development would commence in 2023, with the export of material only; however, vehicle movements are anticipated to be at a maximum in years 2-7, when there would be export and infill. Due to progressively stringent vehicle emissions controls and an increase in newer vehicles in the UK fleet, emissions factors decrease into the futures. Therefore, in order to provide a conservative assessment, 2023 has been used as the assessment year, using 2023 baseline traffic flows and development flows for years 2-7.

A1.1.2 Data for the A3025 Portsmouth Road has been taken from the interactive web-based map provided by the Department for Transport (DfT) (DfT, 2021a). The DfT traffic flows have been factored forward to the assessment year (2023) using the TEMPRO System v7.2c (DfT, 2021b).

A1.1.3 Traffic speeds have been estimated for other roads based on the speed limit, reduced to 20 km/h within 25m of a junction stop line. Diurnal flow profiles for the traffic have been derived from the national diurnal profiles published by the DfT (DfT, 2021c).

A1.1.4 The traffic data used to calculate emissions are shown in **Table A1** and the modelled road network is shown in **Figure 1**.

Table A1: Summary of Traffic Data used in the Assessment

Road Link	AADT			% HDVs [a]	
	2019	2023 Without Dev.	2023 With Dev.	Without Dev.	With Dev.
Hamble Lane S access	16,129	16,333	16,527	4.3	4.8
Hamble Lane N access	16,129	16,333	16,527	4.3	4.8
Hamble Lane N Hound Rd	21,555	21,809	22,003	1.8	2.2
Hamble Lane N A3025 Portsmouth Rd	32,987	33,391	33,585	2.6	2.8
Hamble Lane N Tesco	32,641	33,040	33,234	1.5	1.7
A3025 Hamble	26,040	27,063	27,257	2.5	2.8
A3025 Portsmouth Rd	10,572	10,987	10,987	3.2	3.2

a HDV is heavy duty vehicle >3.5 tonnes (heavy goods vehicle + buses).

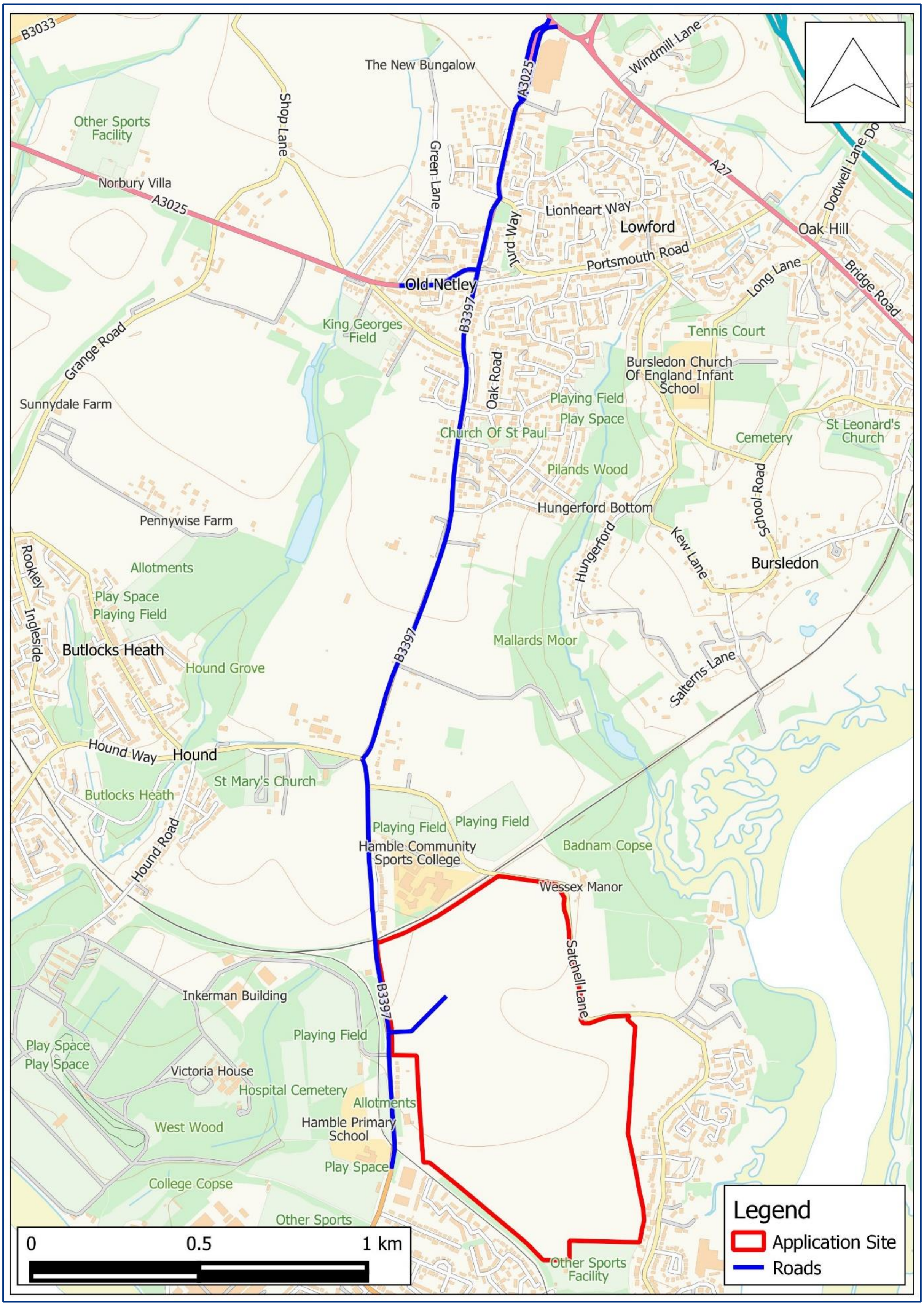

Figure 1: Modelled Roads

Emissions

A1.1.5 Emissions have been calculated using the most recent version of the Emissions Factor Toolkit (EFT) v11.0. The traffic data were entered into the EFT in order to calculate a combined emission rate for each of the road links in the modelled network.

Meteorological Data

A1.1.6 The model has been run using the full year of meteorological data that corresponds with the most recent set of published NO_2 monitoring data used for the model verification (2019, see below). The meteorological data has been taken from the monitoring station located at Southampton Airport, which is considered suitable for the area.

A1.2. Background Concentrations

A1.2.1 Background concentrations have been derived from those published by Defra (Defra, 2021b). These cover the whole country on a 1 km by 1 km grid and are published for each year from 2018 to 2030. The current maps have been verified against measurements undertaken during 2018.

A1.3. Verification

A1.3.1 The verification process seeks to minimise uncertainties associated with the air quality model by comparing the model output with locally measured concentrations.

NO_2

A1.3.2 Most NO_2 is produced in the atmosphere by reaction of nitric oxide (NO) with ozone. It is therefore most appropriate to verify the model in terms of primary pollutant emissions of nitrogen oxides (NOx = NO + NO_2). The model has been run to predict the 2019 annual mean NOx concentrations at the HL, HL2 and HL3 diffusion tube monitoring sites.

A1.3.3 The model output of road-NOx has been compared with the 'measured' road-NOx, calculated from the measured annual mean NO_2 concentrations and the background concentrations using the NOx from NO_2 calculator v8.1 published by Defra (Defra, 2021b).

A1.3.4 The slope of the best-fit line between the 'measured' road-NOx contribution and the model derived road-NOx contribution, forced through zero, has been used to determine the adjustment factor (**Figure 2**). The adjustment factor of 1.3 has been applied to the modelled road-NOx concentration for each receptor to provide adjusted modelled road-NOx concentrations. The NOx to NO_2 calculator has then been used to determine total NO_2 concentrations from the adjusted modelled road-NOx concentrations and the background NO_2 concentrations.

A1.3.5 A comparison of the final adjusted modelled total NO_2 at each monitoring site to the measured total NO_2 shows close agreement (**Figure 3**).

A1.3.6 The results imply that the model has under-predicted the road-NOx contribution. This is a common experience with this and most other models. An evaluation of the model performance using statistical methods is shown in **Table A2**.

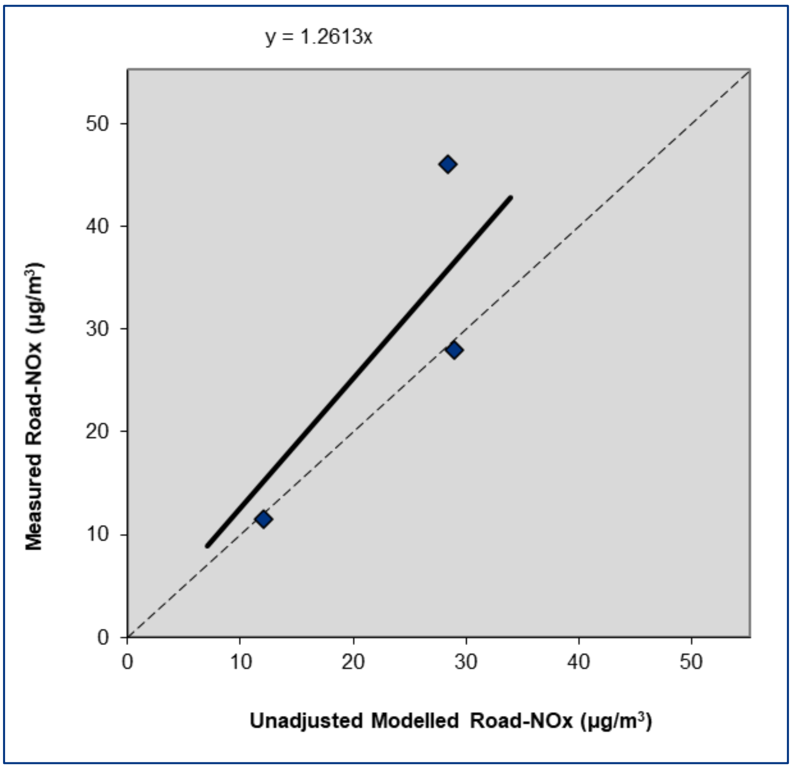

Figure 2: Comparison of Measured Road NOx to Unadjusted Modelled Road NOx Concentrations.

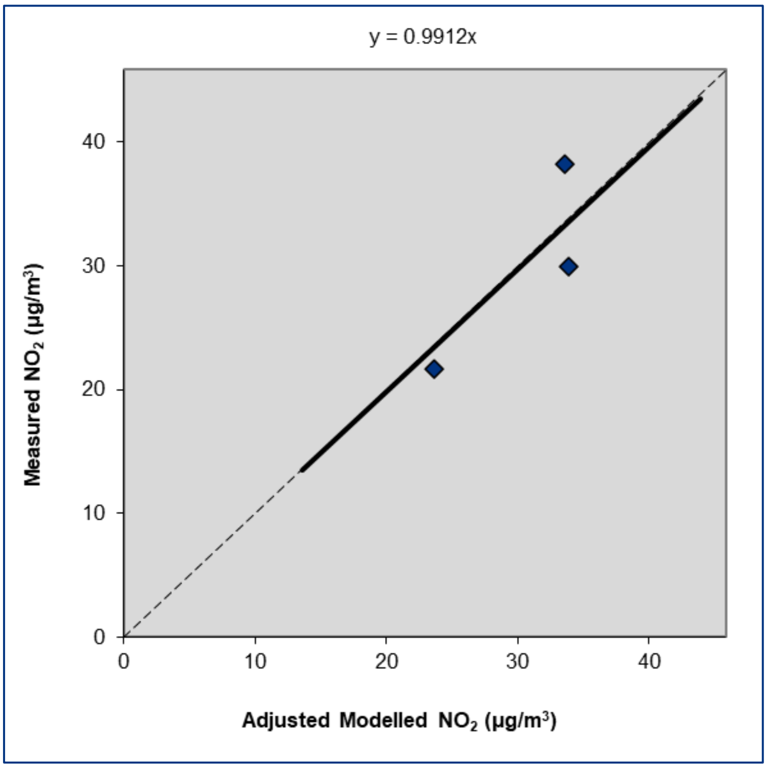

Figure 3: Comparison of Measured Total NO_2 to Primary Adjusted Modelled Total NO_2 Concentrations.

Table A2: Evaluation of Model Performance

Statistical Parameter	Description	Values		
		Before verification (Figure 2)	After verification (Figure 3)	Ideal
Correlation coefficient	Linear relationship between predicted and observed data. Less useful for small datasets as single high/low values can have a large effect.	0.84	0.85	1
Fractional bias	Identifies systematic tendency to over/under predict (negative = over-predict, positive = under-predict).	0.21	-0.01	0.0
Root mean square error (RMSE)	Average error of the model (µg/m^3). Ideally within 10% of the annual mean NO_2 objective, i.e., 4 µg/m^3; however, within 25% acceptable, i.e., 10 µg/m^3.	10.22	3.70	0.0

PM_{10} and $PM_{2.5}$

A1.3.7 The adjustment factor for NOx has been used to adjust the modelled road-PM contribution.

A1.4. Model Post-processing

NO_2

A1.4.1 The NOx to NO_2 calculator v8.1 published by Defra has been used to convert the modelled, verified road-NOx output for each receptor to road-NO_2. The background NO_2 concentrations have then been added to the predicted road-NO_2 concentrations to give the final predicted concentrations.

PM_{10} and $PM_{2.5}$

A1.4.2 The verified road-PM outputs need no further processing and have been added to the background concentrations to give the final predicted concentrations.

A2 Dust Risk Assessment Methodology

A2.1. Screening

A2.1.1 A detailed dust assessment would usually be required where there is a human or sensitive ecological receptor within 250m of a sand and/or gravel site, measured from the nearest dust generating activities. Fugitive dust emissions due to operations at the landfill are likely to be similar to those from a sand/gravel site. Where there are no sensitive receptors within 250m of a sand and/or gravel site it would normally be assumed that a detailed dust assessment is not required.

A2.1.2 The sensitivity of receptors is defined in **Table A3**, **Table A4** and **Table A5**; however, professional judgement should be used to identify where on the spectrum between high and low sensitivity a receptor lies.

A2.2. Dust Impact Risk and Magnitude of Dust Effect

A2.2.1 The amenity dust impact risk is determined by combining the residual source emissions and the pathway effectiveness, as shown in **Table A6**. The magnitude of the dust effect is then described by combining the dust impact risk with the receptor sensitivity, as shown in **Table A7**. The significance of the effect on amenity is determined to be either significant or not significant. The judgement of significance should be made by a competent, suitably qualified professional, and the professional experience of the consultant preparing this report is set out in **Appendix** Error! R eference source not found..

A2.2.2 With regard to health effects, the IAQM minerals guidance takes the approach that, if background ambient PM_{10} concentrations are below 17µg/m^3, there is little risk that a process contribution from a dust source would lead to an exceedance of the objectives. For this assessment, should the background PM_{10} concentration at the application site be less than 17µg/m^3, the impact from the proposed development on health will be deemed as not significant.

A2.2.3 Where background PM_{10} concentrations are above 17 µg/m^3, the impact has been described by estimating the contribution to annual mean PM_{10} concentrations due to the operation of the proposed development and adding this to the background PM_{10} concentration to determine the total annual mean PM_{10} concentration and comparing this with the annual mean air quality objective.

Table A3: Sensitivities of People to Dust Soiling

Class	Principles	Examples
High	Users can reasonably expect enjoyment of a high level of amenity; or the appearance, aesthetics or value of their property would be diminished by soiling; and the people or property would reasonably be expected a to be present continuously, or at least regularly for extended periods, as part of the normal pattern of use of the land.	Dwellings, museum and other culturally important collections, medium and long term car parks and car showrooms.
Medium	Users would expect to enjoy a reasonable level of amenity, but would not reasonably expect to enjoy the same level of amenity as in their home; or the appearance, aesthetics or value of their property could be diminished by soiling; or the people or property wouldn't reasonably be expected to be present here continuously or regularly for extended periods as part of the normal pattern of use of the land.	Parks and places of work.
Low	The enjoyment of amenity would not reasonably be expected; or property would not reasonably be expected to be diminished in appearance, aesthetics or value by soiling; or there is transient exposure, where the people or property would reasonably be expected to be present only for limited periods of time as part of the normal pattern of use of the land.	Playing fields, farmland (unless commercially-sensitive horticultural), footpaths, short term car parks and roads.

Table A4: Sensitivities of People to PM_{10}

Class	Principles	Examples
High	Locations where members of the public may be exposed for eight hours or more in a day.	Residential properties, hospitals, schools and residential care homes.
Medium	Locations where the people exposed are workers, and where individuals may be exposed for eight hours or more in a day.	Office and shop workers, but will generally not include workers occupationally exposed to PM_{10}
Low	Locations where human exposure is transient.	Public footpaths, playing fields, parks and shopping streets.

Table A5: Sensitivities of Receptors to Ecological Effects

Class	Principles	Examples
High	Locations with an international or national designation and the designated features may be affected by dust soiling; or locations where there is a community of a particularly dust sensitive species.	Special Areas of Conservation (SAC) with dust sensitive features.
Medium	Locations where there is a particularly important plant species, where its dust sensitivity is uncertain or unknown; or locations with a national designation where the features may be affected by dust deposition.	Sites of Special Scientific Interest (SSSI) with dust sensitive features.
Low	Locations with a local designation where the features may be affected by dust deposition.	Local Nature Reserves with dust sensitive features.

Table A6: Estimation of Dust Impact Risk

Pathway Effectiveness	Residual Source Emissions		
	Small	Medium	Large
Highly Effective	Low	Medium	High
Moderately Effective	Negligible	Low	Medium
Ineffective	Negligible	Negligible	Low

Table A7: Descriptors for Magnitude of Dust Effects

Dust Impact Risk	Receptor Sensitivity		
	Low	Medium	High
High	Slight Adverse	Moderate Adverse	Substantial Adverse
Medium	Negligible	Slight Adverse	Moderate Adverse
Low	Negligible	Negligible	Slight Adverse
Negligible	Negligible	Negligible	Negligible

Residual Source Emissions

A2.2.4 The IAQM guidance sets out examples of the residual source emissions magnitude for a number of activities (see **Table A8**). The residual source emissions take account of designed in mitigation measures and landscaping.

Table A8: Examples of Residual Source Emissions Magnitude

Large	Small
Materials Handling	
High no. heavy plant (>10 loading plant)	Low no. of heavy plant (<5 loading plant)
Unconsolidated / bare surface	Hard standing surface
Activities close to site boundary (<50m of site boundary)	Activities >100m of site boundary
Material of high dust potential	Material of low dust potential
On-site Transportation	
Unconsolidated/unpaved haul road	Conveyors and/or paved haul road
Road surface of high dust potential	Road surface of low dust potential
High no. of HDV movements (>250)	Low no. of HDV movements (<100)
High total haul road length	Low total haul road length (<500m)
Uncontrolled vehicle speed	Controlled vehicle speed (<15 mph)
Off-site Transportation	
High no. HDV movements (>200/day)	Low no. HDV movements (<25/day)
Unconsolidated access road	Paved access road
Limited/no vehicle cleaning facilities	Extensive vehicle cleaning facilities
Small length of access road (<20m)	Large length of access road (>50m)
Site Restoration	
Large working area	Small working area
High volume of material movement	Low volume of material movement
High number of heavy plant	Low number of heavy plant
Material of high dust potential	Material of low dust potential

Pathway Effectiveness

A2.2.5 A frequency category, derived from wind and rainfall data (**Table A9**), and a receptor distance category (**Table A10**) are combined in a matrix (**Table A11**) to classify the pathway effectiveness.

Table A9: Categorisation of Frequency of Potentially Dusty Winds

Frequency Category	Criteria
Infrequent	Frequency of winds (>5 m/s) from the direction of the dust source on dry days are less than 5%
Moderately Frequent	The frequency of winds (>5 m/s) from the direction of the dust source on dry days are between 5% and 12%
Frequent	The frequency of winds (>5 m/s) from the direction of the dust source on dry days are between 12% and 20%
Very Frequent	The frequency of winds (>5 m/s) from the direction of the dust source on dry days are greater than 20%

Table A10: Categorisation of Receptor Distance from Source

Receptor Distance Category	Criteria
Distant	Receptor is between 200m and 400m from dust source
Intermediate	Receptor is between 100m and 200m from dust source
Close	Receptor is less than 100m from dust source

Table A11: Pathway Effectiveness

Receptor Distance Category	Frequency of Potentially Dusty Winds			
	Infrequent	**Moderately Frequent**	**Frequent**	**Very Frequent**
Close	Ineffective	Moderately Effective	Highly Effective	Highly Effective
Intermediate	Ineffective	Moderately Effective	Moderately Effective	Highly Effective
Distant	Ineffective	Ineffective	Moderately Effective	Moderately Effective