APPENDIX 8.1
ASSESSMENT INPUT DATA

Air Quality Environmental Impact Assessment

Appendix 8.1 - Assessment Input Data

Richmond upon Thames College, Twickenham

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1.1 Introduction

1.1.1 The Development has the potential to cause air quality impacts as a result of vehicles travelling to and from the site. In order to assess nitrogen dioxide (NO_2), particulate matter with an aerodynamic diameter of less than 10µm (PM_{10}) concentrations at sensitive locations, detailed dispersion modelling was undertaken in accordance with the following methodology.

1.2 Dispersion Model

1.2.1 Dispersion modelling was undertaken using the ADMS-Roads dispersion model (version 5.0.0.1). ADMS-Roads is developed by Cambridge Environmental Research Consultants (CERC) and is routinely used throughout the world for the prediction of pollutant dispersion from road sources. Modelling predictions from this software package are accepted within the UK by the Environment Agency and Department for Environment, Food and Rural Affairs (DEFRA).

1.2.2 The model requires input data that details the following parameters:

- Assessment area;
- Traffic flow data;
- Vehicle emission factors;
- Spatial co-ordinates of emissions;
- Street width;
- Meteorological data;
- Roughness length (z_0); and,
- Monin-Obukhov length.

1.2.3 These are detailed in the following Sections.

1.3 Assessment Area

1.3.1 The assessment area was defined based on the Site location and anticipated vehicle trip distribution from the Development. Ambient concentrations were predicted over National Grid Reference (NGR): 514970, 173430 to 515790, 174250. One Cartesian grid was used within the model to produce data suitable for contour plotting using the Surfer software package.

1.3.2 Reference should be made to Figure 8.10 in Appendix 8.2 for a map of the assessment area.

1.4 Traffic Flow Data

1.4.1 Baseline traffic data for use in the assessment, including 24-hour Annual Average Daily Traffic (AADT) flows and fleet composition as Heavy Duty Vehicle (HDV) proportion, was provided by RGP Transport Planning and Infrastructure Design, the Transport Consultants for the project.

1.4.2 Traffic data for several roads was not available. As such, information for these links was obtained from the Department for Transport (DfT)[1]. The DfT web tool enables the user to view and download traffic flows on every link of the 'A' road and motorway network, as well as selected minor roads, in Great Britain for the years 1999 to 2019. It should be noted that the DfT web tool is referenced in DEFRA guidance[2] as being a suitable source of data for air quality assessments and it is therefore considered to provide a reasonable estimate of traffic flows in the vicinity of the Site.

1.4.3 The baseline DfT traffic data was converted to the opening year utilising a factor obtained from TEMPro (version 7.2). This software package has been development by the DfT to calculate future traffic growth throughout the UK.

1.4.4 Development trip generation rates and associated distribution for the DfT links were provided by RGP Transport Planning and Infrastructure Design. These movements were added to the baseline data to provide an estimation of traffic flows with the Development in place.

1.4.5 A summary of the traffic flow data is provided in Table A8.1.1. Road widths were estimated from aerial photography and UK highway design standards.

[1] https://roadtraffic.dft.gov.uk/#16/51.4499/-0.3396/basemap-countpoints.

[2] Local Air Quality Management Technical Guidance (TG16), DEFRA, 2018.

Table A8.1.1 Traffic Data

Link		24-hour AADT Flow			HDV Prop. of Fleet (%)	Average Vehicle Speed (km/h)	Road Width (m)
		Verif.	2024 DM	2024 DS			
L1	A316, Chertsey Road, Eastbound (EB), West of Langhorn Drive	22,301	23,452	23,743	2.63	35	8.6
L2	A316, Chertsey Road, EB, East of Langhorn Drive	22,301	23,452	23,568	2.63	35	8.6
L3	A316, Chertsey Road, EB, West of B531, Slow Phase (SP)	22,301	23,452	23,568	2.63	20	9.0
L4	A316, Chertsey Road, East of B531, SP	44,602	46,903	47,020	2.63	20	18.9
L5	A316, Chertsey Road, East of B531	44,602	46,903	47,020	2.63	35	12.1
L6	A316, Chertsey Road, East of A310	44,602	46,903	47,020	2.63	35	15.7
L7	A316, Chertsey Road, Westbound (WB), West of Langhorn Drive	22,301	23,452	23,743	2.63	35	8.5
L8	Landhorn Drive	1,335	1,404	1,987	2.63	25	5.9
L9	Landhorn Drive, South of A316, SP	1,335	1,404	1,987	2.63	20	14.7
L10	A316, Chertsey Road, WB, East of Langhorn Drive	22,301	23,452	23,568	2.63	35	8.5
L11	A316, Chertsey Road, WB, West of B531, SP	22,301	23,452	23,568	2.63	20	6.8
L12	A310, London Drive, South of B531	8,953	9,415	9,473	2.63	35	12.9
L13	A310, London Drive, South of B531, SP	8,953	9,415	9,473	2.63	20	14.2
L14	B531, Whitton Road, North of A310, SP	8,953	9,415	9,473	2.63	20	15.1
L15	B531, Whitton Road, North of A310	8,953	9,415	9,473	2.63	30	9.0
L16	B531, Whitton Road, South of A316, SP	8,953	9,415	9,473	2.63	20	14.8
L17	B531, Whitton Road, North of A316, SP	8,953	9,415	9,473	2.63	20	15.9

Link		24-hour AADT Flow			HDV Prop. of Fleet (%)	Average Vehicle Speed (km/h)	Road Width (m)
		Verif.	2024 DM	2024 DS			
L18	B531, Whitton Road, North of A316	8,953	9,415	9,473	2.63	30	7.7
L19	B531, Whitton Road, East of Palmerston Road	8,953	9,415	9,473	2.63	25	13.8
L20	B531, Whitton Road, West of Palmerston Road	8,953	9,415	9,473	2.63	30	8.9
L21	A310, London Drive, East of B531, SP	12,901	13,567	13,567	4.03	20	11.6
L22	A310, London Drive, South of A316	12,901	13,567	13,567	4.03	30	8.8
L23	A310, Twickenham Road, North of A316	20,942	22,023	22,023	3.96	30	9.5
R1	A316/B531 Roundabout	21,422	22,527	22,586	2.63	30	11.7
R2	A316/A310 Roundabout	30,762	32,349	32,396	4.03	30	9.9

1.4.6 Reference should be made to Figure 8.10 in Appendix 8.2 for a graphical representation of the road link locations.

1.5 Emission Factors

1.5.1 Emission factors for each link were calculated using the relevant traffic flows and the Emissions Factor Toolkit (version 10.1). This has been produced by DEFRA and incorporates COPERT 5.3 vehicle emission factors and fleet information.

1.5.2 There is current uncertainty over NO_2 concentrations within the UK, with the implementation of new vehicle emission standards not resulting in the previously expected reduction in roadside levels. Therefore, 2019 emission factors were utilised in preference to the Development opening year in order to provide robust model outputs. As predictions for 2019 were verified, it is considered the results are a robust indication of worst case concentrations for the future year.

1.6 Meteorological Data

1.6.1 Meteorological data used in the assessment was taken from Heathrow Airport meteorological station over the period 1st January 2019 to 31st December 2019 (inclusive). Heathrow Airport meteorological station is located at NGR: 506947, 176515, which is approximately 9.8km north-west of the Site. It is anticipated that conditions would be reasonably similar over a distance of this magnitude. The data was therefore considered suitable for an assessment of this nature.

1.6.2 All meteorological records used in the assessment were provided by Atmospheric Dispersion Modelling (ADM) Ltd, which is an established distributor of data within the UK. Reference should be made to Figure 8.2 in for a wind rose of the utilised meteorological data.

1.7 Roughness Length

1.7.1 The z_0 is a modelling parameter applied to allow consideration of surface height roughness elements. A z_0 of 1 m was used to describe the modelling extents. This is considered appropriate for the morphology of the area and is suggested within ADMS-Roads as being suitable for 'cities, woodland'.

1.7.2 A z_0 of 0.3m was used to describe the meteorological site. This is considered appropriate for the morphology of the area and is suggested within ADMS-Roads as being suitable for 'agricultural areas (max)'.

1.8 Monin-Obukhov Length

1.8.1 The Monin-Obukhov length provides a measure of the stability of the atmosphere. A minimum Monin-Obukhov length of 100m was used to describe the modelling extents and meteorological site. This value is considered appropriate for the nature of both areas and is suggested within ADMS-Roads as being suitable for 'large conurbations greater than 1 million'.

1.9 Background Concentrations

1.9.1 Annual mean NO_2 and PM_{10} background concentrations were taken from the DEFRA mapping study for the grid square containing the 58 - London Road, Twickenham monitoring position, NGR: 516500, 173500. These are shown in Table A8.1.2.

Table A8.1.2 Background Pollutant Concentration

Pollutant	Predicted 2019 Background Concentration (µg/m^3)
NO_2	21.56
PM_{10}	16.84

1.9.2 The values shown in Table A8.1.2 were chosen to represent concentrations throughout the dispersion modelling extents without the contribution from road vehicles as they were higher than the DEFRA background for the grid square containing the Site, as shown in Table 8.14 Chapter 8 - Air Quality.

1.9.3 Similarly to emission factors, background concentrations from 2019 were utilised in preference to the opening year. This provided a robust assessment and is likely to overestimate pollutant concentrations during the operation of the Development.

1.9.4 It is noted that the GLA have released background concentration maps with a spatial resolution of 20m for 2013, 2020, 2025 and 2030. However, as the modelling area is considerably greater than 20m, and values were not available for the verification year, this data was not considered appropriate for use in the assessment.

1.10 NO_x to NO_2 Conversion

1.10.1 Predicted annual mean oxides of nitrogen (NO_x) concentrations were converted to NO_2 concentrations using the spreadsheet (version 8.1) provided by DEFRA, which is the method detailed within GLA guidance[3].

[3] London Local Air Quality Management (LLAQM)), Technical Guidance 2019 (LLAQM.TG (19)), GLA, 2019.

1.11 Prediction of 24-hour PM_{10} Concentrations

1.11.1 Predicted annual mean PM_{10} concentrations were converted to the number of days with PM_{10} concentrations above 50µg/m^3 using the equation outlined in the GLA guidance[4].

1.12 Verification

1.12.1 The predicted results from a dispersion model may differ from measured concentrations for a large number of reasons, including:

- Estimates of background concentrations;
- Uncertainties in source activity data such as traffic flows and emission factors;
- Variations in meteorological conditions;
- Overall model limitations; and,
- Uncertainties associated with monitoring data, including locations.

1.12.2 Model verification is the process by which these and other uncertainties are investigated and where possible minimised. In reality, the differences between modelled and monitored results are likely to be a combination of all of these aspects.

1.12.3 For the purpose of the assessment model verification was undertaken for 2019 using traffic data, meteorological data and monitoring results from this year.

1.12.4 The London Borough of Richmond upon Thames (LBoRuT) undertook monitoring of NO_2 concentrations at five locations within the vicinity of roads included within the model during 2019. The results were obtained and the road contributions to total NO_x concentrations calculated following the methodology contained within GLA guidance[5]. The monitored annual mean NO_2 concentrations and calculated road NO_x concentrations are summarised in Table A8.1.3.

[4] London Local Air Quality Management (LLAQM)), Technical Guidance 2019 (LLAQM.TG (19)), GLA, 2019.

[5] London Local Air Quality Management (LLAQM)), Technical Guidance 2019 (LLAQM.TG (19)), GLA, 2019.

Table A8.1.3 NO_X Verification - Monitoring Results

Monitoring Location		Monitored NO_2 Concentration ($\mu g/m^3$)	Calculated Road NO_x Concentration ($\mu g/m^3$)
RHG	Mobile Air Quality Unit, Chertsey Road, TW2	36.0	31.44
13	Whitton Rd, Whitton	36.0	31.44
31	A316 (near Chudleigh Road)	45.0	54.11
58	London Road, Twickenham	40.0	41.19
59	Whitton Road, Twickenham	34.0	26.75

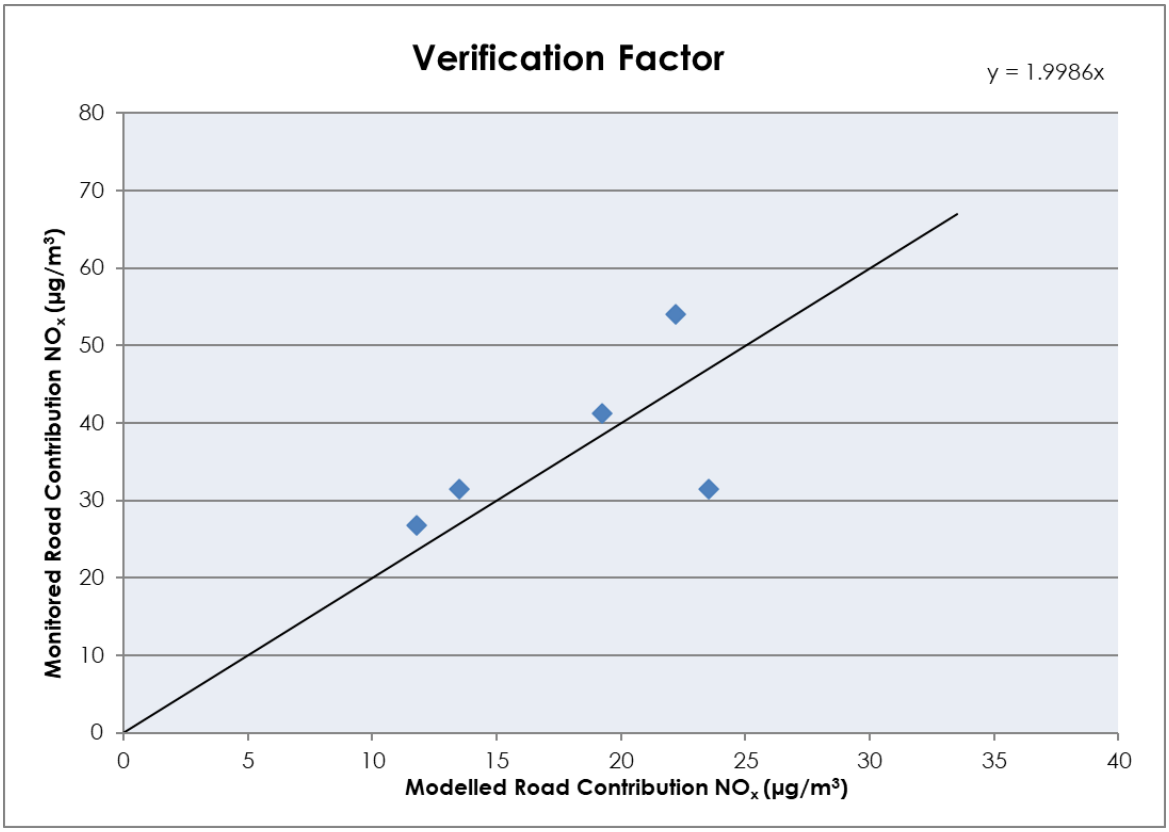
1.12.5 The annual mean road NO_x concentrations predicted from the dispersion model and the 2019 road NO_x concentrations calculated from the monitoring results are summarised in Table A8.1.4.

Table A8.1.4 NO_X Verification - Modelling Results

Monitoring Location		Calculated Road NO_x Concentration ($\mu g/m^3$)	Modelled Road NO_x Concentration ($\mu g/m^3$)
RHG	Mobile Air Quality Unit, Chertsey Road, TW2	31.44	23.52
13	Whitton Rd, Whitton	31.44	13.53
31	A316 (near Chudleigh Road)	54.11	22.19
58	London Road, Twickenham	41.19	19.24
59	Whitton Road, Twickenham	26.75	11.81

1.12.6 The monitored and modelled road NO_x concentrations were graphed and the equation of the trendline based on linear progression through zero calculated. This indicated that a verification factor of 1.9986 was required to be applied to all road NO_x modelling results, as shown in Graph A8.1.1.

Graph A8.1.1 NO_x Verification Factor



1.12.7 LBoRuT undertook monitoring of PM_{10} concentrations at one location within the vicinity of roads included within the model during 2019. The monitored annual mean PM_{10} concentration and modelled PM_{10} concentration is shown in Table A8.1.5

Table A8.1.5 PM_{10} Verification - Modelling Result

Monitoring Location		Monitored PM_{10} Concentration (µg/m³)	Modelled Road PM_{10} Concentration (µg/m³)
RHG	Mobile Air Quality Unit, Chertsey Road, TW2	20.0	19.1

1.12.8 The monitored and modelled PM_{10} concentrations were compared to calculate the associated ratio. This indicated a verification factor of 1.0498 was required to be applied to all PM_{10} modelling results.