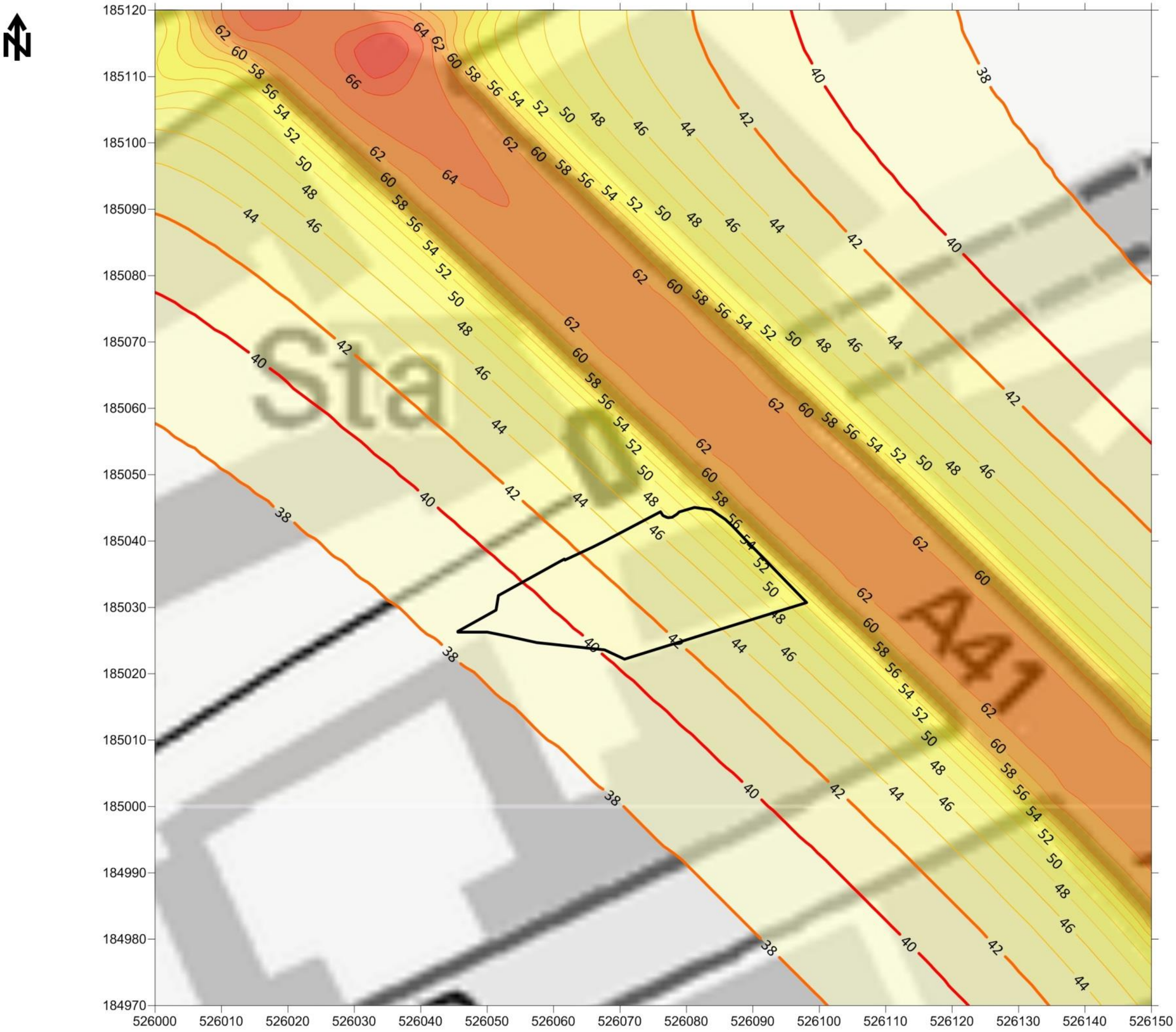


Legend

Site Boundary

70
68
66
64
62
60
58
56
54
52
50
48
46
44
42
40
38

Predicted Annual Mean NO_2 Concentration (μg/m³)

Title

Figure 8

Predicted Annual Mean NO_2 Concentrations (μg/m³) 2017

z = 1.5

Project

Air Quality Assessment
317 Finchley Road, London

Project Number

AQ100339

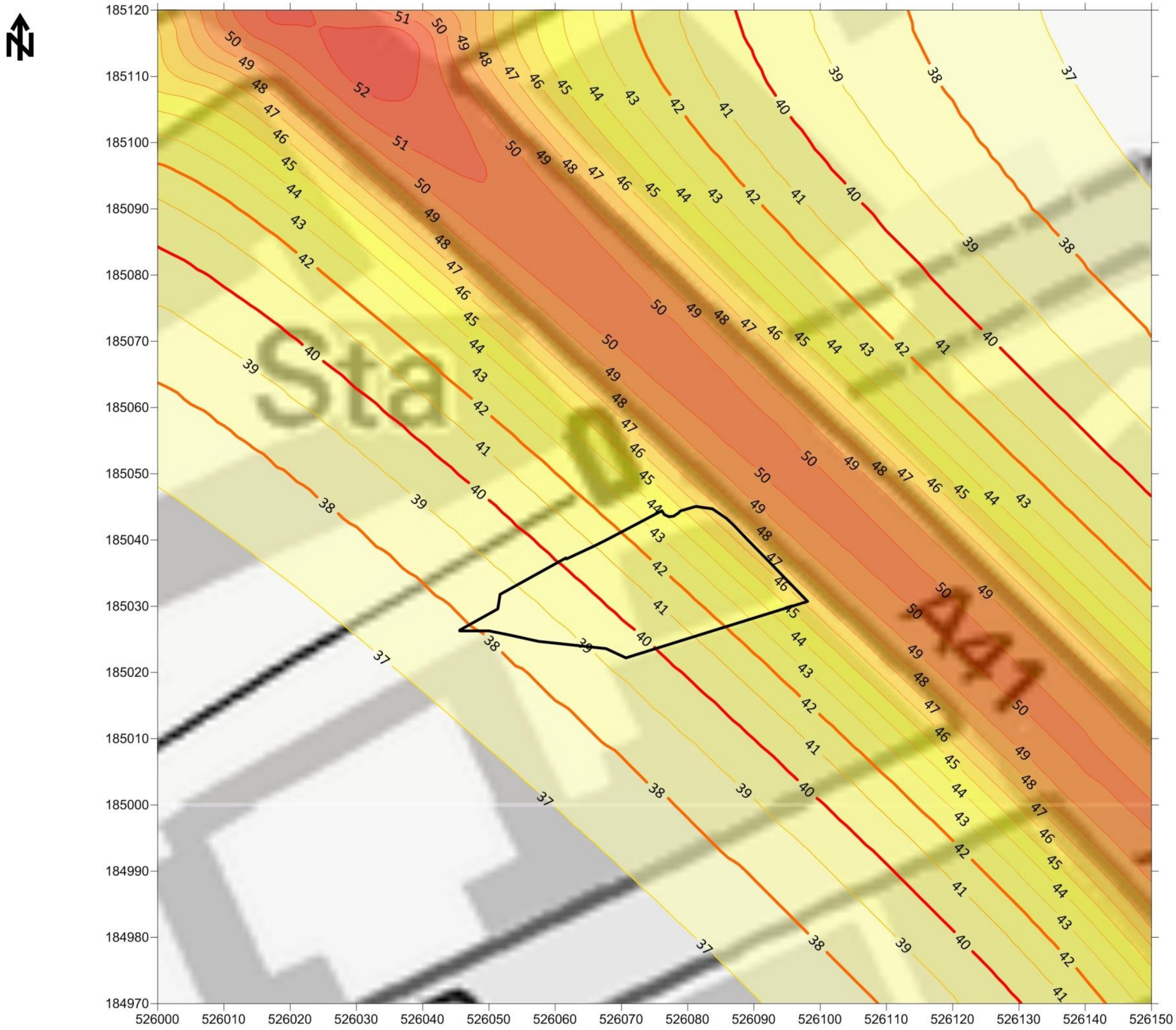
Client

317 Finchley Road Ltd

REC Resource & Environmental Consultants Ltd

Resource and Environmental Consultants Ltd
Osprey House, Broadway, Manchester M50 2UE

Tel – 0161 868 1300 Fax – 0161 868 1301
www.recltd.co.uk



Legend

Site Boundary

Predicted Annual Mean NO_2 Concentration ($\mu g/m^3$)

53
52
51
50
49
48
47
46
45
44
43
42
41
40
39
38
37

Title

Figure 9

Predicted Annual Mean NO_2 Concentrations ($\mu g/m^3$) 2017

z = 4.5m

Project

Air Quality Assessment

317 Finchley Road, London

Project Number

AQ100339

Client

317 Finchley Road Ltd

REC

Resource & Environmental Consultants Ltd

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Osprey House, Broadway, Manchester M50 2UE

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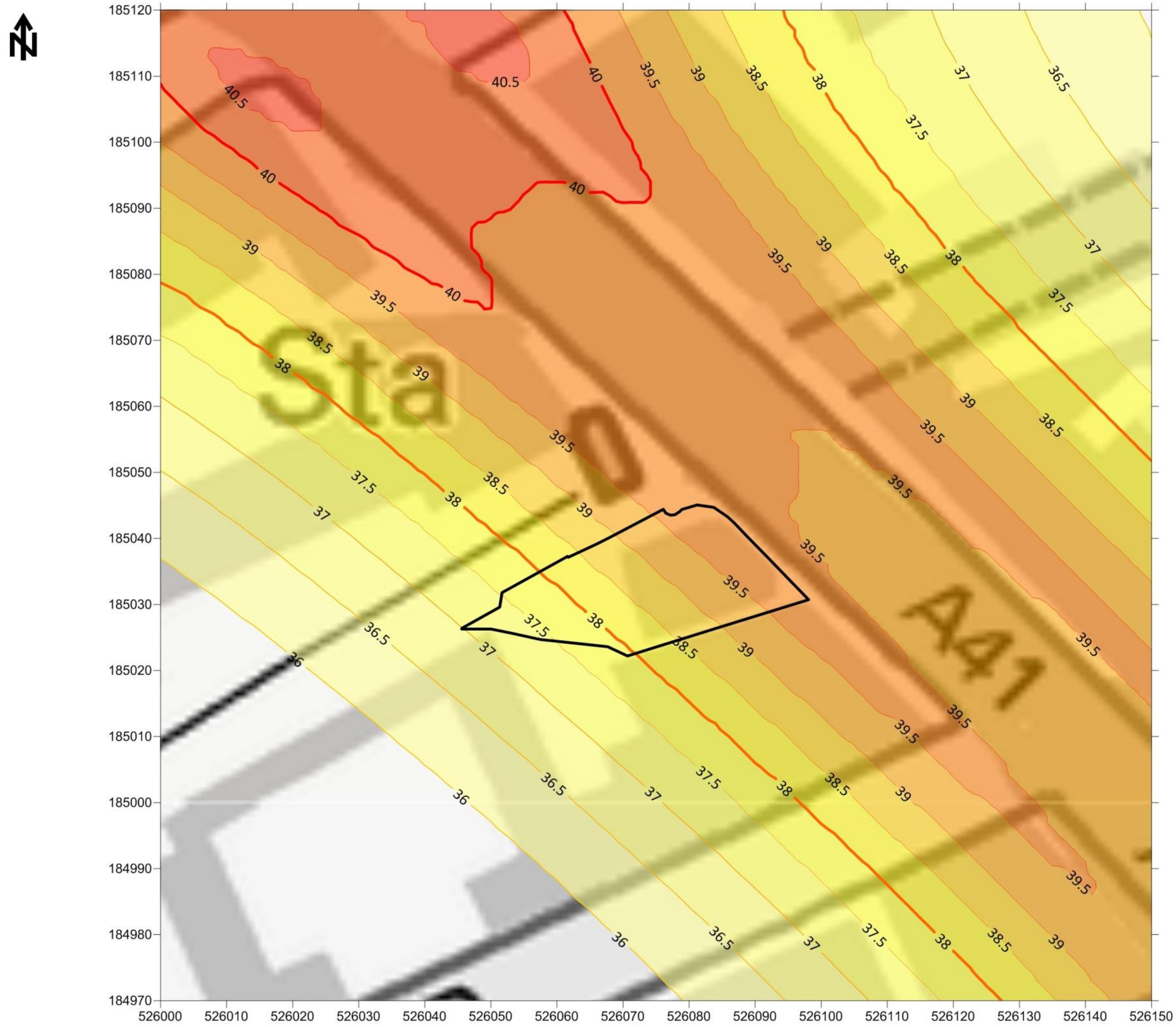

Legend

Site Boundary

Predicted Annual Mean NO_2 Concentration (µg/m^3)

41.0
40.5
40.0
39.5
39.0
38.5
38.0
37.5
37.0
36.5
36.0

Title

Figure 10

Predicted Annual Mean NO_2 Concentrations (µg/m^3) 2017

z = 7.5m

Project

Air Quality Assessment
317 Finchley Road, London

Project Number

AQ100339

Client

317 Finchley Road Ltd

REC Resource & Environmental Consultants Ltd

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Osprey House, Broadway, Manchester M50 2UE

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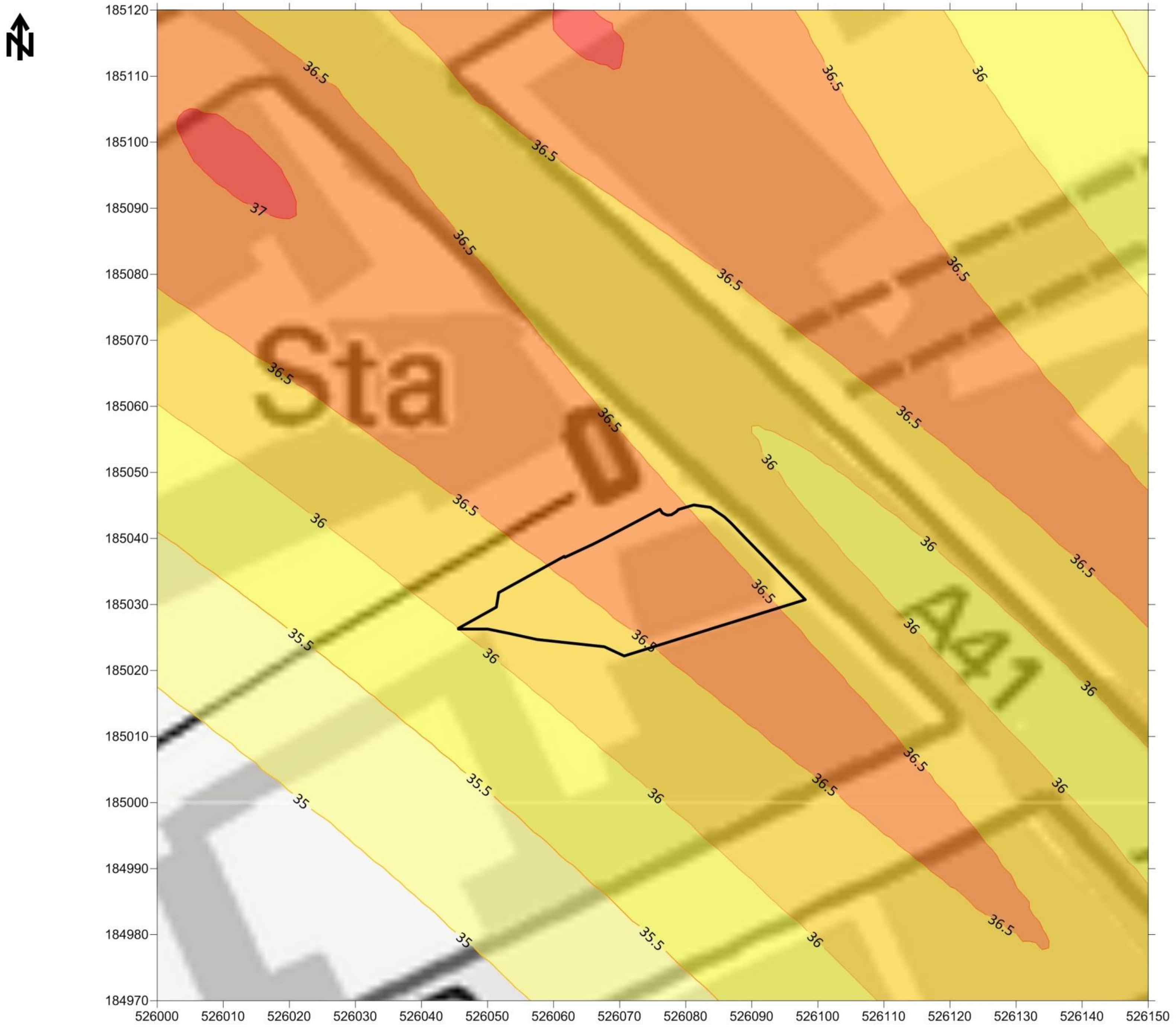
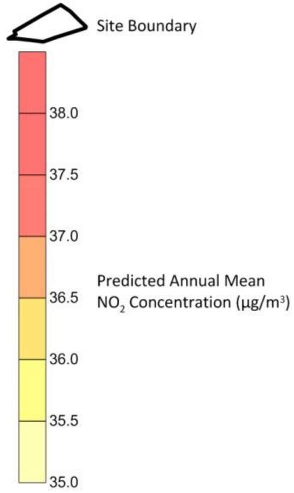


Legend



Title

Figure 11

Predicted Annual Mean NO_2

Concentrations (µg/m³) 2017

z = 10.5m

Project

Air Quality Assessment

317 Finchley Road, London

Project Number

AQ100339

Client

317 Finchley Road Ltd

REC Resource & Environmental Consultants Ltd

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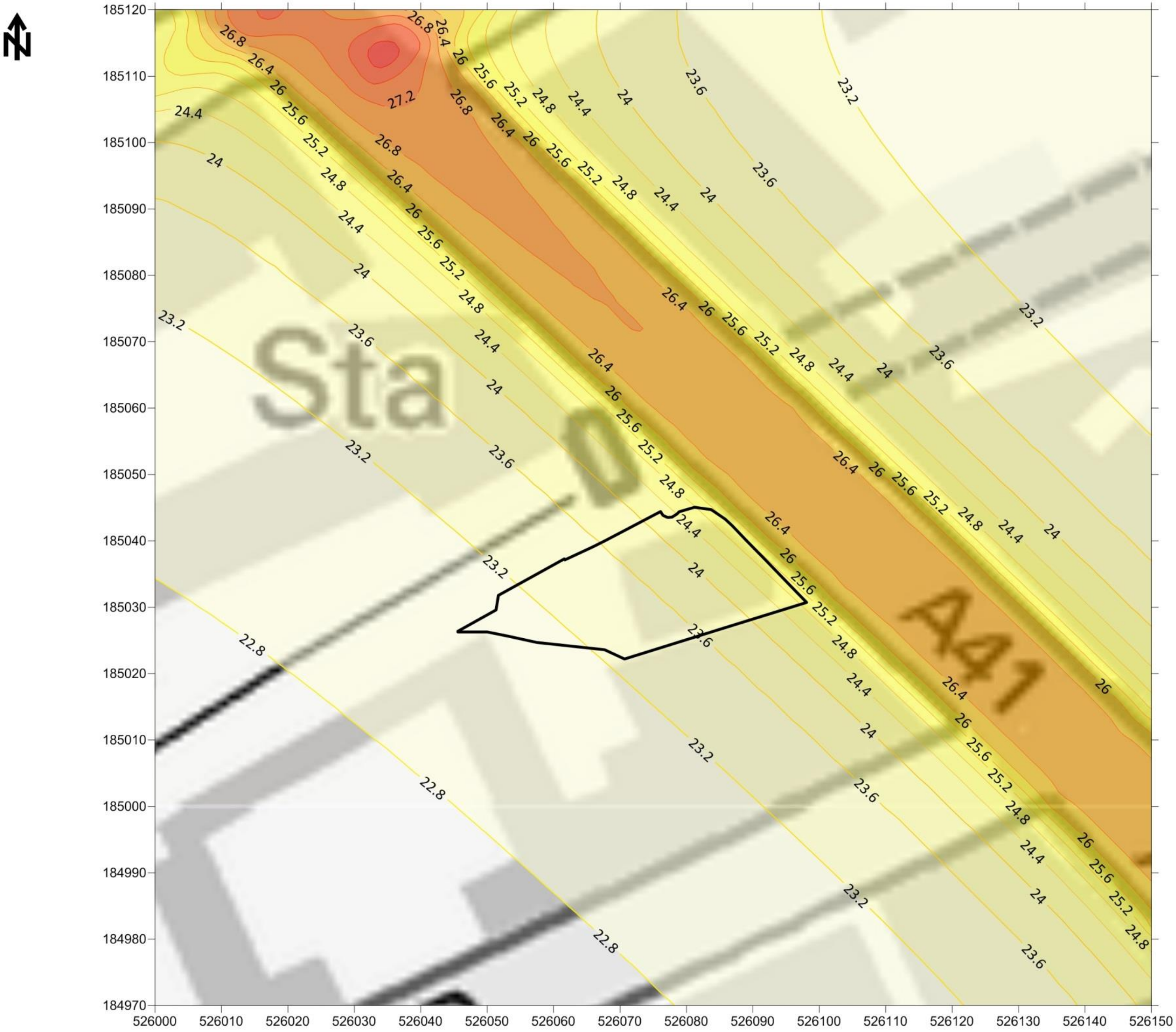

Legend

Site Boundary

Predicted Annual Mean PM_{10} Concentration (µg/m³)

28.0
27.6
27.2
26.8
26.4
26.0
25.6
25.2
24.8
24.4
24.0
23.6
23.2
22.8

Title

Figure 12

Predicted Annual Mean PM_{10} Concentrations (µg/m³) 2017 DM

z = 1.5m

Project

Air Quality Assessment
317 Finchley Road, London

Project Number

AQ100339

Client

317 Finchley Road Ltd

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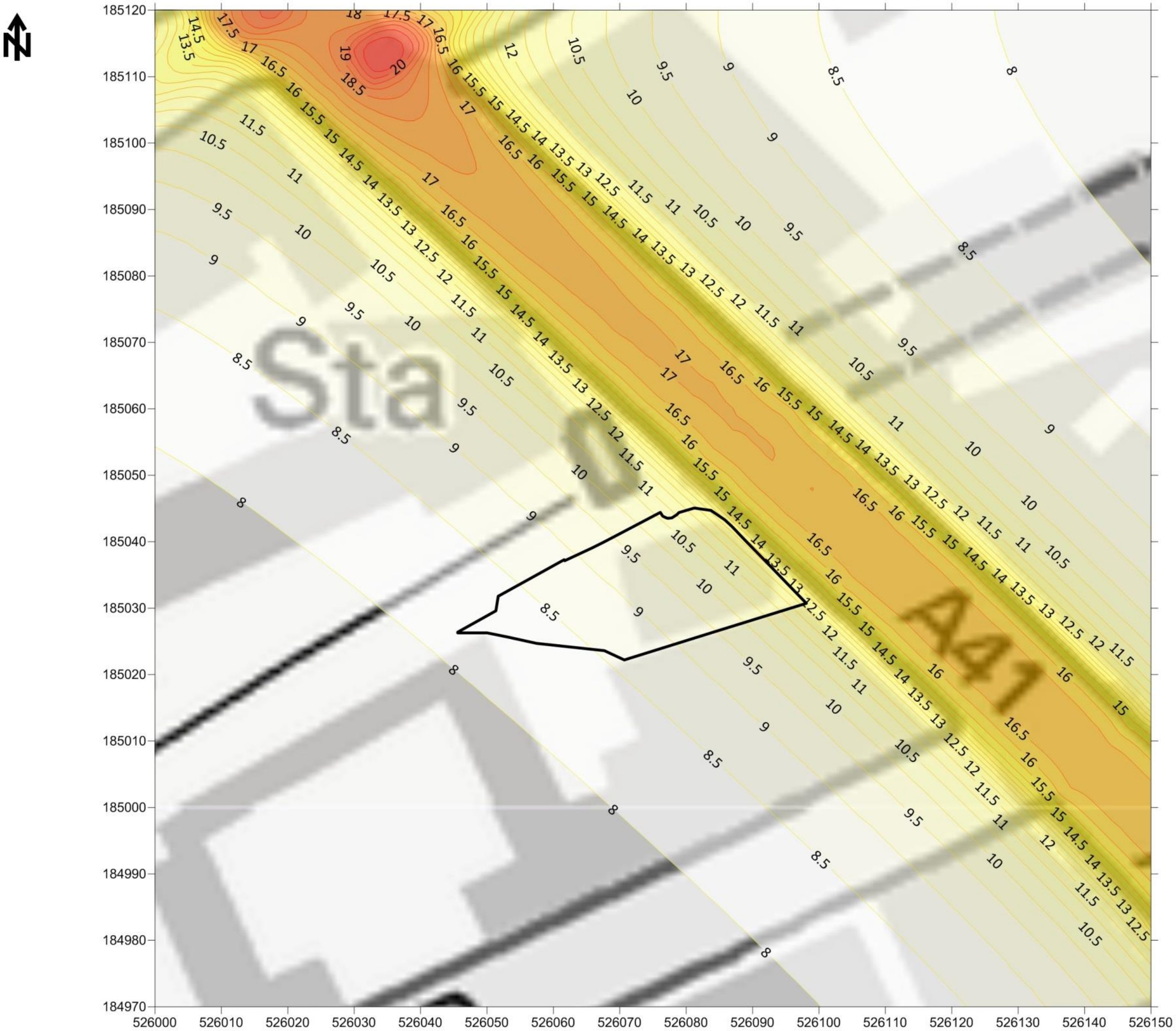

Legend

Site Boundary

21.0
20.5
20.0
19.5
19.0
18.5
18.0
17.5
17.0
16.5
16.0
15.5
15.0
14.5
14.0
13.5
13.0
12.5
12.0
11.5
11.0
10.5
10.0
9.5
9.0
8.5
8.0

Predicted Number of Days with PM_{10} Concentrations Greater than 50µg/m³

Title

Figure 13

Predicted Number of Days with PM_{10} Concentrations Greater than 50µg/m³

z = 1.5m

Project

Air Quality Assessment

317 Finchley Road, London

Project Number

AQ100339

Client

317 Finchley Road Ltd

REC Resource & Environmental Consultants Ltd

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APPENDIX II ASSESSMENT INPUT DATA

ASSESSMENT INPUTS

The proposals are located within an AQMA and therefore there is the potential to expose future users to elevated pollution levels. Dispersion modelling using ADMS Roads was therefore undertaken to predict NO_2 and PM_{10} concentrations at sensitive locations both with and without the development in order to consider potential changes as a result of the proposals.

The dispersion 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; and,
- Monin-Obukhov length.

Assessment inputs are described in the following subsections.

Dispersion Model

Dispersion modelling was undertaken using the ADMS Roads dispersion model (version 3.4). 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 DEFRA.

Assessment Area

Ambient concentrations were predicted over the area NGR: 526000, 184970 to 526150, 185120 at the following heights:

- 1.5m - Ground Floor;
- 4.5m - First Floor;
- 7.5m - Second Floor; and,
- 10.5m - Third Floor.

Results were subsequently used to produce contour plots within the Surfer software package.

Reference should be made to Figure 7 for a graphical representation of the assessment grid extents.

Traffic Flow Data

24-hour Annual Average Daily Traffic (AADT) flows and fleet composition as HDV proportion were obtained from the London Atmospheric Emissions Inventory (LAEI). The LAEI (2010) was released by the GLA in 2013 and provides information on emissions from all sources of air pollutants in the Greater London area.

Growth factors provided by the Trip End Model Presentation Program (TEMPRO) software package were utilised to allow for conversion from the obtained 2012 traffic flow year to 2013, which was used for model verification, and from 2015 to 2017, which was used to represent the development opening year.

Road widths were estimated from aerial photography and UK highway design standards. Reference should be made to Figure 7 for a graphical representation of the road link locations. A summary of the traffic data used in the verification scenarios is provided in Table AII.1.

Table AII.1 2013 Traffic Data

Road Link		Road Width (m)	24-hour AADT Flow	HDV Prop. (%)	Mean Vehicle Speed (km/h)
1A	A41 Finchley Road - North of Canfield Gardens	22.0	47,323	6.58	25
1B	A41 Finchley Road Northbound - South of Canfield Gardens	11.0	23,661	6.58	20
1Bii	A41 Finchley Road Southbound - South of Canfield Gardens (Left side of Junction)	11.0	10,746	10.87	20
1C	A41 Finchley Road Southbound - South of Canfield Gardens	11.0	23,661	6.58	20
1D	A41 Finchley Road Southbound - South of Canfield Gardens (Junction)	11.0	10,746	10.87	10
1E	A41 Finchley Road Southbound - South of Canfield Gardens (Left Turn)	6.3	10,746	10.87	10
2A	B511 Fitzjohn's Avenue	11.8	17,339	7.28	20
3A	Arkwright Road	7.3	10,875	7.08	35
4A	Lymington Road	6.8	6,480	5.86	25
5A	Buckland Crescent	9.1	11,485	7.85	25
6A	B511 College Crescent - North of Buckland Crescent	7.3	17,339	7.28	25
6B	B511 College Crescent Southbound - South of Buckland Crescent	7.3	23,661	6.58	15
6C	B511 College Crescent Northbound - South of Buckland Crescent	7.3	8,669	7.28	10
7A	A41 Finchley Road - South of Junction	18.3	21,491	10.87	25
8A	A41 Avenue Road	18.3	47,323	6.58	25
9A	A41 Finchley Road - South of Junction (Right Turn)	6.3	3,642	4.01	10

The road width and mean vehicle speed shown in Table AII.1 remained the same for 2017. A summary of the 2017 traffic data is shown in Table AII.2.

Table AII.2 2017 Traffic Data

Road Link		Road Width (m)	24-hour AADT Flow	HDV Prop. (%)	Mean Vehicle Speed (km/h)
1A	A41 Finchley Road - North of Canfield Gardens	22.0	48,276	6.58	25
1B	A41 Finchley Road Northbound - South of Canfield Gardens	11.0	24,138	6.58	20
1Bii	A41 Finchley Road Southbound - South of Canfield Gardens (Left side of Junction)	11.0	10,962	10.87	20
1C	A41 Finchley Road Southbound - South of Canfield Gardens	11.0	24,138	6.58	20
1D	A41 Finchley Road Southbound - South of Canfield Gardens (Junction)	11.0	10,962	10.87	10
1E	A41 Finchley Road Southbound - South of Canfield Gardens (Left Turn)	6.3	10,962	10.87	10
2A	B511 Fitzjohn's Avenue	11.8	17,687	7.28	20
3A	Arkwright Road	7.3	11,094	7.08	35
4A	Lymington Road	6.8	6,610	5.86	25
5A	Buckland Crescent	9.1	11,716	7.85	25
6A	B511 College Crescent - North of Buckland Crescent	7.3	17,687	7.28	25
6B	B511 College Crescent Southbound - South of Buckland Crescent	7.3	24,138	6.58	15
6C	B511 College Crescent Northbound - South of Buckland Crescent	7.3	8,844	7.28	10
7A	A41 Finchley Road - South of Junction	18.3	21,924	10.87	25
8A	A41 Avenue Road	18.3	48,276	6.58	25
9A	A41 Finchley Road - South of Junction (Right Turn)	6.3	3,716	4.01	10

Emission Factors

Emission factors for each link were calculated using the relevant traffic flows and the Emissions Factor Toolkit (version 6.0.2) released in November 2014, which incorporates updated COPERT4v10 vehicle emissions factors for NO_x and vehicle fleet information.

There is current uncertainty over NO_2 concentrations within the UK, with roadside levels not reducing as previously expected due to the implementation of new vehicle emission standards. Therefore, 2013 emission factors have been utilised for the prediction of pollution levels for all scenarios in preference to the development opening year in order to provide a robust assessment.

Gradients

The procedure provided within Appendix 2 of the DEFRA Guidance LAQM.(TG16)[26] was utilised in order to calculate an appropriate emission factor along road link 2A, due to the significant gradient in this area. The gradient of the road link was derived from Google Earth.

In accordance with the DEFRA guidance, normal speed related emission factors from the Emissions Factor Toolkit were used for Low Duty Vehicles (LDVs), whereas revised emission factors were calculated for HDVs. Gradients and emission factors for links within the modelling extents with a significant gradient are shown in Table.

Table AII.3 Gradients and NO_x Emission Factors for HDVs

Road Link	Gradient (%)	Speed related Emission Factor (g/km)	Revised Emission Factor (g/km)
2A	5.6	0.1975	1.0093

Meteorological Data

Meteorological data used in this assessment was taken from London City meteorological station over the period 1st January 2013 to 31st December 2013 (inclusive). London City meteorological station is located at approximate NGR: 543005, 180509, which is approximately 4.6km south-east of the proposed development. DEFRA guidance LAQM.(TG16)[27] recommends meteorological stations within 30km of an assessment area as being suitable for detailed modelling.

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 6 for a wind rose of utilised meteorological data.

Roughness Length

A roughness length (z_0) of 1.5m was used in this dispersion modelling study. This value of z_0 is considered appropriate for the morphology of the assessment area and is suggested within ADMS-Roads as being suitable for 'large urban areas'.

A z_0 of 0.3m was utilised to represent the morphology of the meteorological station location and is suggested as being suitable for 'agricultural areas (max)'.

26 Local Air Quality Management Guidance LAQM.(TG16), DEFRA, 2016.
27 Local Air Quality Management Technical Guidance LAQM.(TG16), DEFRA, 2016.

Monin-Obukhov Length

The Monin-Obukhov length provides a measure of the stability of the atmosphere. A minimum Monin-Obukhov length of 100m was used in this dispersion modelling study. This value is considered appropriate for the nature of the assessment area and meteorological station location and is suggested within ADMS-Roads as being suitable for 'large conurbations > 1 million'.

Background Concentrations

An annual mean NO_2 concentration of 31.76µg/m^3 and PM_{10} concentration of 22.21µg/m^3, as predicted by DEFRA, were used to represent background levels in the vicinity of the site.

Similarly to emission factors, background concentrations for 2013 were utilised in preference to the development opening year. This provided a robust assessment and is likely to overestimate actual pollutant concentrations during the operation of the proposal.

NO_x to NO_2 Conversion

Predicted annual mean NO_x concentrations from the dispersion model were converted to NO_2 concentrations using the spreadsheet provided by DEFRA, which is the method detailed within LAQM.(TG16)[28].

Verification

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.

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.

For the purpose of this assessment model verification was undertaken for 2013, using traffic data, meteorological data and monitoring results from this year.

LBoC undertakes monitoring of NO_2 concentrations at one roadside location within the assessment extents. The road contribution to total NO_x concentration was calculated from the monitored NO_2 result for use in the verification process. This was undertaken following the methodology contained within DEFRA guidance LAQM.(TG16)[28]. The monitored annual mean NO_2 concentration and calculated road NO_x concentration are summarised in Table AII.4.

28 Local Air Quality Management Technical Guidance LAQM.(TG16), DEFRA, 2016.

Table AII.4 2013 Monitoring Results

Monitoring Location		Monitored NO_2 Concentration (µg/m^3)	Calculated Road NO_x Concentration (µg/m^3)
CA17	47 Fitzjohn's Avenue	65.24	93.08

The dispersion model was run with the traffic input data previously detailed for 2013 to predict the NO_x concentration at the monitoring locations. The results are shown in Table AII.5.

Table AII.5 Verification Results

Monitoring Location		Modelled Road NO_x Concentration (µg/m^3)
CA17	47 Fitzjohn's Avenue	79.22

The monitored and modelled NO_x road contribution concentrations were graphed and the equation of the trendline based on the linear progression through zero calculated. This indicated a verification factor of **1.1750** was required to be applied to all modelling results.

As PM_{10} monitoring is not undertaken within the assessment extents, a verification factor of **1.1750** was also used to adjust model predictions of this pollutant in accordance with the guidance provided within LAQM.(TG16)[29].

[29] Local Air Quality Management Technical Guidance LAQM.(TG16), DEFRA, 2016.

APPENDIX III ASSESSOR'S CURRICULUM VITAE

GABOR ANTONY

Principal Air Quality Consultant

MSc, MIAQM, MIEnvSc

REC
Resource & Environmental Consultants Ltd

KEY EXPERIENCE:

Gabor is a Principal Consultant with specialist experience in the air quality and odour sector. His key capabilities include:

- Advanced atmospheric air dispersion modelling of road vehicle and industrial emissions using ADMS-ROADS, ADMS-5, AERMOD-PRIME and BREEZE-ROADS.
- Preparation of factual and interpretative Air Quality Assessment reports and Air Quality Environmental Statement chapters in the vicinity of proposed schemes and developments in accordance with DEFRA, Environment Agency and EPUK methodologies.
- Management and delivery of project work on key, land development and urban regeneration projects.
- Multi-source industrial air emissions and stack emissions assessments using AERMOD-PRIME modelling software for IPPC Permit applications and stand-alone technical reports.
- Co-ordination and management of different emission and immission related measurements, and various monitoring programmes including construction dust; diffusion tube surveys and odour assessments in accordance with DEFRA and Environment Agency guidance.

QUALIFICATIONS:

- Master of Science degree
- Member, Institution of Environmental Sciences (MIEnvSc)
- Member, Institute of Air Quality Management (MIAQM).

SELECT PROJECTS SUMMARY:

Residential Developments

Boorley Green - EIA undertaken for mixed use scheme.
Vauxhall - AQA for mixed use scheme within AQMA in London.
Mapplewell - AQA for residential development.
Catford Stadium - Low Emission Transport Strategy for mixed use development in London
Lambeth Road - AQA for mixed use scheme in AQMA in London.
Thurmaston NEoLSUE - EIA for Suburban extension.
Westferry Print works - EIA for large mixed use development.
Grange Farm, Doncaster - AQA for residential development.
Wadi Al Asla - AQA as part of EIA for proposed urban extension in Saudi Arabia.
Horndean - AQA for residential development adjacent to A3.
Derby - Fire and Smoke assessment for residential development.
Kirkby Muxloe - AQA for residential development adjacent to M1.
Ushaw Moor - AQA for residential development in proximity of AQMA.

Commercial and Retail Developments

Horfield, Bristol - EIA for Mixed- use development in AQMA.
Nottingham - Biomass boiler assessment for retail facility.
South Woodham Ferrers - Biomass boiler and road traffic assessment.
Widnes - AQA for Shopping Centre Extension, adjacent to AQMA.
Lancaster Science Park - AQA for commercial development in proximity of AQMA.
Haymarket - AQA for Bus Station Redevelopment.
Bath Western Riverside East - AQA as part of EIA for mixed use development.
Irvine, North Ayrshire - AQA for Hospital redevelopment
Derby - biomass boiler emission assessment.
Bristol & Bath Science Park - AQA as part of EIA for commercial development.
Sheffield Superstore - AQA in support of new food superstore.
Nuneaton - AQA for mixed use development with biomass boiler.
Thorp Arch, - EIA for Urban extension.
Reading Station - AQA Highway Implementation Scheme.
Ebbsfleet International Railway Station - AQA for mixed use development.
M4 Junction 11 - AQA for Motorway Scheme.
Hook - Biomass Boiler and road transport assessment for proposed food store.

Industrial Developments

University of Birmingham - Environmental Permit Variation Application for existing CHP facility.
Southampton - AQA for Sulphur Plant.
Sedalcol - Environmental Permit Application for Alcohol and Starch production facility.
Cotesbach - AQA for Fully enclosed Waste composting Facility.
Wagg Foods - Environmental Permit application.
Trent Foundry - Environmental Permit Application for Existing foundry in Scunthorpe.
Beddington - AQA for Energy from Waste Plant.
Thakeham - AQA for mushroom production facility.
Partington - EIA for Liquid Natural Gas storage site demolition works in Trafford.
South View Farm - Ammonia dispersion modelling of broiler farm.
Blackwater - AQA for Asphalt plant Permit Application.

JASMINE RHOADES

Air Quality Consultant

BSc (Hons), MSc, AMIEnvSc

KEY EXPERIENCE:

Jasmine is a Environmental Consultant with specialist experience in the air quality sector. Her key capabilities include:

- Production of Air Quality Assessments to the Department for Environment, Food and Rural Affairs (DEFRA), Environment Agency and Environmental Protection UK (EPUK) methodologies for clients from the residential, commercial and commercial sectors.
- Detailed dispersion modelling of road vehicle emissions using ADMS-Roads. Studies have included impact assessment of pollutant concentrations at various floor levels and assessment of suitability of development sites for proposed end-use.
- Assessment of road vehicle exhaust emissions using the Design Manual for Roads and Bridges (DMRB) calculation spreadsheet.
- Assessment of dust impacts from construction sites to the Institute of Air Quality Management (IAQM) methodology.
- Production of air quality mitigation strategies for developments throughout the UK.
- Defining baseline air quality conditions and identification of sensitive areas.

QUALIFICATIONS:

- Bachelor of Science
- Master of Science
- Associate Member of the Institute of Environmental Science (IES)

SELECT PROJECTS SUMMARY:

Residential Development: High Street, Fenstanton

Air Quality Assessment in support of a residential development consisting of eighty one residential units. Construction phase assessment of fugitive dust emissions in accordance with IAQM methodology was undertaken. Additionally, dispersion modelling of road vehicle exhaust emissions was undertaken using ADMS-Roads to quantify pollutant levels across the site and provide consideration of potential impacts of the surrounding area as a result of the proposals. Impacts were not predicted to be significant at any sensitive receptors in the vicinity of the site and no mitigation was required.

Residential Development: Field Close, Southmoor

Air Quality Assessment in support of a proposed development consisting of seventy three residential units. Concerns were raised as the site was located in close proximity to the A420, a significant source of road traffic exhaust emissions with the potential to expose future users to poor air quality. Dispersion modelling of road vehicle exhaust emissions was completed using ADMS-Roads to consider site suitability for the proposed end-use. Pollutant concentrations were predicted to be below the relevant AQO across the site and as such, air quality was not a planning constraint.

Commercial Development: Eridge Road, Tunbridge Wells

Air Quality Constraints Assessment in support of the development of an ALDI foodstore located within an AQMA. Construction phase assessment of fugitive dust emissions in accordance with IAQM methodology was undertaken. In addition, dispersion modelling was also conducted using ADMS-Roads to consider the impact of the proposals on sensitive locations. Impacts were not predicted to be significant at any sensitive receptors in the vicinity of the site and no mitigation was required.

Residential Development: Farrier Close, Uxbridge

Air Quality Assessment in support of a residential development consisting of sixty extra-care apartments. The site was located in an area identified by the London Borough of Hillingdon as experiencing elevated pollutant concentrations and subsequently there were concerns the proposals would introduce future users to poor air quality. Dispersion modelling was undertaken at all floors in order to quantify pollutant concentrations at the site and assess the potential for future exposure. The results of the dispersion modelling indicated that pollutant concentrations were predicted to exceed the relevant air quality criteria for the proposed land-use. As such, mitigation was recommended in the form of mechanical ventilation at first floor level.

Industrial development: Snape Lane, Harworth

Air Quality Assessment in support of an industrial redevelopment of a former glassworks site to provide three manufacturing plants (brick, roof tile and timber frame). The development had the potential to cause air quality impacts at sensitive locations associated with fugitive dust emissions from manufacturing activities. A qualitative fugitive dust assessment was undertaken in accordance with EPUK and IAQM guidance alongside relevant data on dust emissions and dispersion derived from the Mineral Policy Statement 2. In addition, dispersion modelling was undertaken using ADMS-Roads to quantify pollutant concentrations at sensitive locations. Mitigation was recommended in order protect sensitive locations from fugitive dust emissions. The dispersion modelling indicated that pollutant concentrations were predicted to be below the relevant AQOs at all sensitive locations. Air quality was therefore not a planning constraint.