Dartford Borough Council

Local Air Quality Management – Detailed Assessment Report

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Client

Dartford Borough Council
Civic Centre
Home Gardens
Dartford
Kent

Project Manager **Phil Kessel**
Tel: **01322 343346**
Fax:

Environmental Consultant

Casella Stanger
Great Guildford House
30 Great Guildford Street
London
SE1 0ES

Project Manager **Sharon Atkins**
Tel: **0207 9026167**
Fax: **0207 9026149**

Project Team ***Richard Maggs***
Sharon Atkins
Yvonne Brown

Principal Author ***Sharon Atkins***

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EXECUTIVE SUMMARY

Part IV of the Environment Act 1995 places a statutory duty on local authorities to review and assess the air quality within their area and take account of Government guidance when undertaking such work. This Detailed Assessment is a requirement of the second round of review and assessment for local authorities that have identified areas for further assessment in their previously submitted Updating and Screening Assessment (USA). The Report has been undertaken in accordance with the Technical Guidance LAQM.TG (03).

Between 1998 and 2001, Dartford Borough Council undertook its first round of review and assessment of air quality The first round assessments (Stages 1, 2 and 3) concluded that it was necessary to declare an Air Quality Management Area (AQMA) for nitrogen dioxide (NO_2) and fine particulates (PM_{10}) near to the A282 Dartford Tunnel Approach Road.

The first phase of the second round of review and assessment, the USA, was completed in May 2003 and this provided an update with respect to air quality issues within Dartford Borough Council. The USA concluded that a Detailed Assessment was required for the nitrogen dioxide (NO_2) annual mean Objective in Dartford Town Centre (Highfield Road/Instone Street), along the A226 London Road (through Greenhithe and Swanscombe), the A206 University Way, and five heavily trafficked junctions with nearby relevant exposure:

1) Bean Interchange
2) A226/B255 St Clement's Way
3) A226 East Hill/Park Road
4) A226 The Brent/Watling Street/St Vincents Road
5) A225 Lowfield Street/Princes Road.

A Detailed Assessment of fine particulates (PM_{10}) was also required at the busy A226/B255 St Clement's Way junction in Greenhithe.

Verification of the model has been undertaken using a Kent-wide approach based on 2003 monitoring data, which due to prevailing meteorological conditions, was a poor year for air quality and yielded high monitoring results for PM_{10} and NO_2 (See Appendix 1 for monitoring trends).

Results of the detailed modelling assessment show that all areas (with relevant receptor locations) will exceed the annual objective of 40μg/m^3. The highest NO_2 concentrations are predicted at the nearest receptors to the A225 Lowfield Street/Princes Road junction. There are also predicted exceedences of the 24-hour PM_{10} Objective at the nearest receptor to the A226/B255 St Clements junction in 2004.

Predicted exceedences of the Objective within one standard deviation (i.e. within model error) are also shown to occur at the nearest receptor to Bean Interchange, A226 London Road/Ingress Park and A226 East Hill/Park Road junctions. It is therefore recommended that NO_2 monitoring be undertaken at the nearest receptor locations where the highest modelled concentrations are predicted to provide confirmation of compliance with the Objective. It is also recommended that NO_2

monitoring be undertaken at receptors with the highest predicted concentrations in the other assessment areas to provide additional information in support of further assessment work. As there is already an extensive kerbside monitoring programme within the Borough, it may be advisable to rationalise the existing sites to concentrate on receptor-based monitoring at these pollution hotspots.

It is recommended that Dartford Borough Council consider declaring Air Quality Management Areas (AQMA) on the basis of the potential exceedences in the assessment areas highlighted in this Detailed Assessment Report where exposure criteria are fulfilled.

1. INTRODUCTION

1.1 Project Background

Part IV of the Environment Act, 1995, places a statutory duty on local authorities to periodically review and assess the air quality within their area. This Detailed Assessment is a requirement of the second round of review and assessment of air quality (the 'Second Round') for local authorities that have identified areas where there is a risk of exceedence of an air quality objective within their Updating and Screening Assessment. This is due to be completed by the end of April 2004. Casella Stanger was commissioned by Dartford Borough Council to undertake their Detailed Assessment based on the information received by the local authority and County Council Traffic Department.

1.2 Summary of Review and Assessment

The Local Air Quality Management (LAQM) regime was first set down in the 1997 National Air Quality Strategy (NAQS) [1]and introduced the idea of local authority 'Review and Assessment'. Government subsequently published policy and technical guidance related to the review and assessment process in 1998. In 2000, Government reviewed the NAQS and set down a revised Air Quality Strategy for England, Scotland, Wales and Northern Ireland[2] (AQS). This set down a revised framework for air quality standards and objectives for seven pollutants, which were subsequently set in Regulation in 2000 through the Air Quality Regulations 2000[3]. These were subsequently amended in 2002[4].

1.3 The First Round of Review and Assessment

Dartford Borough Council undertook the first round of review and assessment (the 'First Round') between 1998 and 2001. The First Round was a three-stage process, which assessed the sources of seven air pollutants of concern to health: Benzene, 1,3 butadiene, carbon monoxide, lead, nitrogen dioxide (NO_2), fine particulates (PM_{10}) and sulphur dioxide. The conclusions of the First Round were that it was expected that all Air Quality Objectives were expected to be met with the exception of NO_2 and PM_{10}. An Air Quality Management Area was declared along the A282 Dartford Tunnel Approach Road Corridor for PM_{10} and NO_2 from road traffic emissions.

1.4 The Second Round of Review and Assessment

The Second Round commenced in 2003. New Technical Guidance (LAQM.TG (03))[5], Policy Guidance (LAQM.PG (03))[6] and Progress Report Guidance (LAQM.PRG (03))[7] were issued on behalf of Defra in 2003. This guidance sets the framework for the requirements of review and assessment for future years, taking account of experiences from the previous round of review and assessment.

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[1] DoE (1997) The United Kingdom Nation Air Quality Strategy The Stationery Office
[2] DETR (2000) The Air Quality Strategy for England, Scotland, Wales and Northern Ireland – Working together for Clean Air, The Stationery Office
[3] DETR (2000) The Air Quality Regulations 2000, The Stationery Office
[4] Defra (2002) The Air Quality Strategy for England, Scotland, Wales and Northern Ireland: Addendum, The Stationery Office
[5] Defra (2003) Technical Guidance LAQM.TG(03), Part IV of the Environment Act 1995, Local Air Quality Management, The Stationery Office
[6] Defra (2003) Policy Guidance LAQM.PG(03), Part IV of the Environment Act 1995, Local Air Quality Management, The Stationery Office
[7] Defra (2003) Progress Report Guidance LAQM.PRG(2003), Part IV of the Environment Act 1995, Local Air Quality Management, The Stationary Office

The Updating and Screening Assessment (USA) was the first phase of the Second Round. Similar to Stage One of the First Round, there was consideration of the seven pollutants of concern to health and an assessment was made as to whether Air Quality Objectives for these pollutants would be met. Dartford Borough Council completed this in May 2003, with the conclusion that a Detailed Assessment was required for nitrogen dioxide (NO_2) in Dartford Town Centre (Highfield Road/Instone Street), along the A226 London Road (through Greenhithe and Swanscombe), the A206 University Way. Five heavily trafficked junctions with nearby relevant exposure also required to be considered:

1) Bean Interchange
2) A226/B255 St Clement's Way
3) A226 East Hill/Park Road
4) A226 The Brent/Watling Street/St Vincents Road
5) A225 Lowfield Street/Princes Road.

A Detailed Assessment of fine particulates (PM_{10}) was also required at the busy A226/B255 St Clements junction in Greenhithe.

1.5 Scope and Methodology of the Detailed Assessment

The approach to the Detailed Assessment is to provide the local authority with an opportunity to supplement the information they have gathered in their earlier review and assessment work and more accurately assess the impact of pollution sources on local receptors at identified hotspots through dispersion modelling. The aim of the dispersion modelling is to more accurately reflect the results from local monitoring sites across the whole assessment area and allow comparison of pollutant concentrations against the Air Quality Objectives for NO_2 and PM_{10}. The Detailed Assessment will identify with reasonable certainty whether or not there is likely to be an exceedence of the objectives and if so, define the extent and magnitude of the exceedence.

Detailed dispersion modelling has been undertaken using the ADMS-Roads dispersion model using the vehicle emission factors released by DEFRA in 2002. The results of nitrogen dioxide and PM_{10} monitoring carried out within the assessment areas in 2003 have been used, in conjunction with other urban roadside and major trunk road monitoring sites within Kent, to verify and adjust the modelled results accordingly.

The bias adjustment factors for diffusion tubes have been estimated through the triplicate co-location study with the automatic analyser at Bean Interchange (Ightham Cottages), as described in later sections of this report along with full details of model verification procedures. Short term monitoring data (<9 months) has been annualised in accordance with methodology in the Technical Guidance (LAQM. TG (03)).

Pollutant concentrations have been predicted for the current year, assumed to be 2003, and for 2004 for particulates (PM_{10}) and 2005 for nitrogen dioxide.

The Detailed Assessment has been undertaken in accordance with the methodologies provided in the Technical Guidance (LAQM. TG (03)).

2. BASELINE INFORMATION

2.1 Traffic Data

Kent County Council and their consultants Babtie provided the annual average daily traffic flows (AADT) and forecast factors for future years used in this assessment. This has been supplemented by traffic data supplied by Dartford Borough Council. In the absence of speed data, speeds have been based on speed limits, modified according to local conditions to take account of congestion and stop/start vehicle movements at junctions. At such locations, speeds were reduced at junctions to 15kph and in congested areas to 35kph to reflect the higher emissions of queuing traffic. The data used in this assessment, with the forecast vehicle flows for 2004 and 2005, are shown in Table 1.

Table 1 Detailed Assessment Traffic data

Count ID	Road No.	Road name	X	Y	%HDV	Year	AADT	TEMPRO Factor to 2003	AADT 2003	TEMPRO Factor to 2004	AADT 2004	TEMPRO Factor to 2005	AADT 2005
D013861	A296	Park Road	555248	173659	5.9	2001	9160	1.036	9490	1.022	9699	1.049	9957
D024045	A226	Highfield Road	553856	174013	5.5	2002	15465	1.013	15666	1.022	16012	1.049	16438
D024126	A225	Princes Road	555000	173342	4.8	2002	24202	1.013	24516	1.022	25057	1.049	25725
D024167	A206	University Way	554003	175609	19.7	2002	21295	1.013	21571	1.022	22047	1.049	22635
D034458	A206	University Way	554000	175600	18.6	2003	22756	1	22756	1.022	23258	1.049	23878
D034473	A226	London Road	560000	174900	11.9	2003	15615	1	15615	1.022	15959	1.049	16384
DBC	A226	London Road (W)	558464	174636	9.0	2002	12470	1.013	12632	1.022	12911	-	14518
DBC	U/C	Waterstone Park	558464	174636	4.0	2002	224	1.013	227	1.022	232	-	547
DBC	B255	Bean Road	558464	174636	4.7	2002	14637	1.013	14827	1.022	15154	-	17041
DBC	A226	London Road (E)	558464	174636	9.0	2002	17097	1.013	17319	1.022	17701	-	19905
DBC	B255	Station Road	558464	174636	4.7	2002	14035	1.013	14217	1.022	14531	-	16340
DBC	B255/A226	St Clements Way	558464	174636	9.0	2002	38975	1.013	39482	1.022	40352	-	45376
D034483	A225	Princes Road	555500	173300	6.0	2003	30714	1	30714	1.022	31391	1.049	32228
D034530	B255	Bean Road	558600	174400	7.4	2003	24810	1	24810	1.022	25357	1.049	26033
X015352	E3204	Highfield Road	553839	175707	1.9	2001	8778	1.036	9094	1.022	9294	1.049	9542
X015354	A255	Lowfield Street	554066	173543	5.2	2001	11460	1.036	11872	1.022	12134	1.049	12457
X15553G	A226	London Road	559138	174863	9.2	2001	8262	1.036	8559	1.022	8748	1.049	8981
DBC	U/C	Ingress Park	559100	174861	4.8	2003	3751	1	3751	1.022	3834	1.049	3936
X015722	A255	Princes Road	554263	173314	4.2	2001	24385	1.036	25262	1.022	25819	1.049	26508
X015727	A206	Thames Road	553177	175325	14.3	2001	28787	1.036	29823	1.022	30481	1.049	35236
DBC	A206	University Way (With Thames Road Scheme)	553177	175325	12.0	-	-	-	-	-	-	-	36473
DBC	A2026	Burnham Road	553748	174806	5.4	2000	14990	1.06	15889	1.022	16240	1.049	16668
DBC	A206/A2026	University Way/Burnham Road Roundabout	553300	175400	11.7	1999	37465	1.076	40313	1.022	41202	1.049	47629
X026405	A225	Lowfield Street	554000	173500	4.6	2002	12778	1.013	12944	1.022	13229	1.049	13582
X037556	E3204	Highfield Road	553800	173700	1.7	2003	8869	1	8869	1.022	9064	1.049	9306
X037562	A226	East Hill	554400	174000	6.1	2003	19388	1	19388	1.022	19815	1.049	20343
X990874	A226	East Hill	555400	173800	6.2	1999	14620	1.076	15731	1.022	16078	1.049	16506
X990874	A226	The Brent	555400	173800	4.9	1999	13430	1.076	14450	1.022	14769	1.049	15163

Table 1 (Continued) Detailed Assessment Traffic data

Count ID	Road No.	Road name	X	Y	%HDV	Year	AADT	TEMPRO Factor to 2003	AADT 2003	TEMPRO Factor to 2004	AADT 2004	TEMPRO Factor to 2005	AADT 2005
X990874	U3202	St Vincent's Road	555400	173800	2.2	1999	11750	1.076	12643	1.022	12921	1.049	13266
X990874	B2500	Watling Street	555400	173800	3.5	1999	10458	1.076	11253	1.022	11501	1.049	11808
X990874	A226	Roundabout Watling Street	555400	173800	4.1	1999	24552	1.076	26418	1.022	27000	1.049	27720
X002108	B255	Bluewater	558603	173909	7.4	2000	35458	1.06	37585	1.022	38414	1.049	39438
X002132	F2661	Bean Road/Bluewater	558605	173908	5.8	2000	15335	1.06	16255	1.022	16614	1.049	17057
X002133	B255	Bean Road A2	558760	172402	3.7	2000	23309	1.06	24708	1.022	25253	1.049	25926
X002234	B255	Bean A2	558732	172607	4.7	2000	17257	1.06	18292	1.022	18696	1.049	19194
X002235	B255	Bluewater	558756	172578	6.3	2000	12744	1.06	13509	1.022	13807	1.049	14175
DBC	A2	A2 Swanscombe	559000	172700	14.0	1999	98900	1.076	106416	1.022	108762	1.049	111661
DBC	A296	Watling Street	-	-	5.0	2001	21598	1.036	22376	1.022	22869	1.049	23478
DBC	A282	Dartford River Crossing	556100	175300	13.7	2001	150495	1.036	155913	1.022	159350	1.049	163597
DBC	A255	Hawley Road	554991	172106	3.8	2001	11759	1.036	12182	1.022	12451	1.049	12783

DBC – Data supplied by Dartford Borough Council

2.2 Air Quality Monitoring Data

2.2.1 Local Monitoring Data

Dartford Borough Council has three roadside air quality monitoring stations within the Borough located at: the A226/B255 St Clement's Way junction; Bean Interchange; and, Instone Street in Dartford Town Centre, which were installed in June 1999 to more accurately assess levels of NO_2 and PM_{10}. The monitoring results for 2003 for these sites are shown in Table 2 (the data capture for all sites is >95%). There are projected exceedences of the NO_2 annual mean Objective and PM_{10} 24 hour mean Objective at all three roadside sites.

NO_2 concentrations are measured using a chemiluminescent analyser and PM_{10} concentrations are monitored using a Beta Attenuation Monitor (BAM). The stations are calibrated fortnightly in-house and Kent and Medway Air Quality Monitoring Network (KMAQMN) managers, Kings College Environmental Research Group (ERG), ratify the data. The quality assurance/quality control (QA/QC) procedures for the KMAQMN are equivalent to the UK Automatic Urban and Rural Network (AURN) procedures. The manufacturer of the equipment, Enviro Technology Services plc, service the station on a six monthly basis. It should be noted that the network managers have subjected the 2003 data to preliminary ratification, and there may be a slight change once final ratification has been completed.

The Bean roadside continuous nitrogen dioxide data has been used with the co-located diffusion tube data to estimate the bias adjustment factor for the diffusion tubes as shown in Section 2.2.2.

Outside of the continuous monitoring network, Dartford Borough Council operate twenty NO_2 diffusion tubes sites within the Borough, seven of which are sited within the areas undergoing the Detailed Assessment. The tubes are prepared and analysed by Gradko International Limited using the 50% TEA[8] in acetone method. Gradko International participates in the UK National Diffusion Tube Network and the Workplace Analysis Scheme for Efficiency (WASP). They currently hold UKAS accreditation for analysis of diffusion tubes and consistently achieve the highest performance level in annual field inter-laboratory performance comparisons.

There are two urban background diffusion tube sites that show (bias corrected) annual mean levels of NO_2 of 37.5 – 40.1μg/m^3 in 2003. When compared to previous years' results the trend confirms nation-wide observations for pollution occurrence in 2003 where higher levels of all pollutants were shown to occur, when compared to preceding years. Previously, results show that there had been no measured exceedences of the 40μg/m^3 standard at these background sites.

The corrected data for local NO_2 diffusion tube monitoring sites in 2003 are shown in Table 3. There are widespread projected exceedences of the 2005 annual mean Objective at the roadside sites based on forward projection of 2003 data.

Monitoring data at continuous and diffusion tube roadside sites and along major trunk roads in Kent have been collated and assessed for model verification purposes. A Kent-wide verification factor for urban roadside and major trunk road has been established using 42 Roadside and 10 Trunk road sites. This aims to provide a more

[8] TEA = Triethanolamine

robust means of verification, which is especially important where there is only short-term data within the assessment area. The monitoring results for these sites have been corrected according to LAQM.TG(03), using the Kent approach outlined in section 2.2.2, and are shown in Appendix 2.

Table 2 Continuous Monitoring Results 2003

Site ID	X	Y	Location	Annual mean NO_2 ($\mu g/m^3$)	Annual mean NO_x ($\mu g/m^3$)	Annual mean PM_{10} ($\mu g/m^3$)	90th Percentile PM_{10} 24-hour mean ($\mu g/m^3$)	Projected NO_2 Annual Mean 2005
D1 (ZR3)	558622	172752	Ightham Cottages, Bean Interchange	60.0	151.4	39.4	67.9	**56.9**
D2 (ZR2)	554117	173852	Town Centre	56.2	146.5	43.4	73.5	**53.3**
D3 (ZR1)	558460	174671	St Clements Way, Greenhithe	65.4	175.8	49.6	89.2	**62.0**

Table 3 Diffusion Tube Monitoring Results 2003

Site ID	X	Y	Location	Site Type	Annual Mean NO_2 2003 in $\mu g/m^3$ (uncorrected)	Annual Mean NO_2 2003 in $\mu g/m^3$ (bias corrected)	Projected to 2005	No. of months
DA01	554187	173985	Lowfield Street	R	57.0	57.6	**54.6**	9
DA05	558578	172821	Ightham Cottages	R	59.1	59.6	**56.5**	12
DA07	550750	171918	Summerhouse Drive	B	37.1	37.5	**-**	11
DA10	559189	174872	London Road	R	52.4	52.9	**50.2**	12
DA12	553282	175351	University Way	R	54.6	55.2	**52.3**	12
DA14	555484	174441	Bow Arrow Lane	AQMA	68.4	69.1	**65.5**	12
DA16	554108	173318	Princes Road (2)	R	57.8	58.4	**55.3**	12
DA17	552732	173689	Shepherds Lane	R	51.0	51.5	**48.8**	12
DA18	560298	174282	Alkerden Lane	B	39.7	40.1	**-**	12
DA20	555660	174863	Elliot Road	AQMA	58.4	59.0	**55.9**	12
DA21	555501	174005	Brentfield Road	AQMA	53.0	53.6	**50.8**	12
DA22	555600	174030	Brent Way	AQMA	65.1	65.7	**62.3**	12
DA23	555751	173900	The Brent	AQMA	64.0	64.6	**61.2**	12
DA24	555632	173558	Wayville Road	AQMA	52.4	52.9	**50.2**	12
DA25	555795	173210	Queens Gardens	AQMA	53.8	54.4	**51.5**	12
DA26	555880	173365	Princes Road (3)	AQMA	54.9	55.5	**52.6**	12
DA27	555718	173805	Fairway Drive	AQMA	53.5	54.1	**51.2**	12
DA28	558460	174671	Ivy Villas	R	61.8	62.5	**59.2**	11
DA30	557887	175001	Charles Street	R	44.8	45.3	**42.9**	10
DA31	561215	174898	London Road (2)	R	46.4	46.9	**44.4**	12

R=Roadside; B=background; AQMA=monitoring sites in current AQMA.

2.2.2 Calculation of Bias and Period Mean Adjustment

To take account of the bias in the diffusion tubes analysed by Gradko International Limited, an assessment has been made of data from the Bean Roadside site which has triplicate co-located diffusion tubes and >10 months of data capture. The methodology outlined in the Technical Guidance LAQM.TG (03) has been used in the calculation of the bias adjustment factor.

Table 4 Bias Adjustment Factor 2003

Site ID	Location	Annual mean NO_2 ($\mu g/m^3$) continuous analyser	Annual mean NO_2 ($\mu g/m^3$) diffusion tubes	Bias adjustment factor
DA1 (ZR3)	Bean Interchange roadside	60.0	59.2	1.01

2.3 Background Concentrations

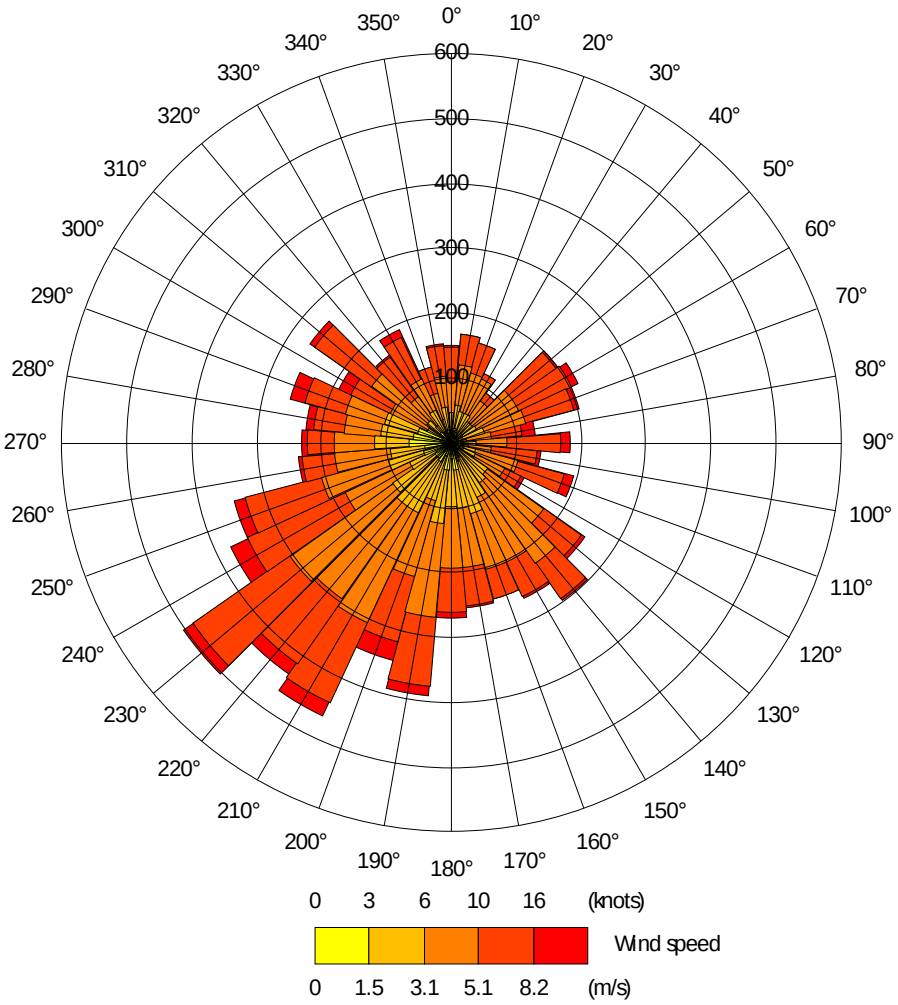
For the NO_2 and PM_{10} assessments, background concentrations have been derived from NETCEN modelled concentration maps for the assessment areas. Projections of background concentrations to future years have been made using the guidance provided in LAQM.TG (03). The background concentrations used in the assessment are shown in Table 5.

Table 5 Background Concentrations in $\mu g/m^3$

Year	Assessment Area	Background NO_X	Background NO_2	Background PM_{10}
2003	Dartford Town Centre	68.0	35.0	-
2005	Dartford Town Centre	62.5	33.0	-
2003	A226 London Road	65.0	34.2	-
2005	A226 London Road	57.8	31.5	-
2003	A206 University Way	60.0	32.3	-
2005	A206 University Way	55.7	30.7	-
2003	Junction 1: Bean Interchange	56.3	31	-
2005	Junction 1: Bean Interchange	51.7	29.2	-
2003	Junction 2: A226/B255 St Clements Way	65.0	34.2	22.1
2004	Junction 2: A226/B255 St Clements Way	-	-	21.8
2005	Junction 2: A226/B255 St Clements Way	57.8	31.5	-
2003	Junction 3: A226 East Hill/Park Road	72.0	36.7	-
2005	Junction 3: A226 East Hill/Park Road	65.9	34.5	-
2003	Junction 4: A226 The Brent/Watling Street	72.0	36.7	-
2005	Junction 4: A226 The Brent/Watling Street	65.9	34.5	-
2003	Junction 5: A225 Lowfield Street/Princes Road	71.8	36.6	-
2005	Junction 5: A225 Lowfield Street/Princes Road	65.7	34.5	-

3. DISPERSION MODELLING METHODOLOGY

Detailed dispersion modelling of NO_X and PM_{10} has been undertaken using the Cambridge Environmental Research Consultants (CERC) Ltd ADMS-Roads advanced gaussian air dispersion model. The most recent year's meteorological data (2002) has been used from Manston meteorological station. The wind rose for the Manston meteorological data shown below shows the dominant south-westerly wind direction.



ADMS-Roads is the latest model in the ADMS family from Cambridge Environmental Research Consultants. Based on the ADMS-Urban system, it can model up to 150 road sources and 7 industrial sources at any one time. The model has been extensively used in local air quality management, and has formed the basis for many AQMA declarations. A considerable number of validation studies have been completed, showing overall excellent agreement between model outputs and observations at continuous monitoring sites. ADMS-Roads has integrated modules to take into the account the effects of street canyons and plume chemistry.

The most up to date and suitable emissions data for vehicles have been used for the assessment. In line with recent advice from Department for Transport (DfT) regarding the use of emissions factors for road vehicles, the current assessment has

used the Emission Factors Toolkit (EFT) to determine emission rates for the dispersion modelling of traffic sources. The EFT is based on the new DfT emission factors as described within the National Atmospheric Emissions Inventory (NAEI).

The use of ADMS-Roads allows any number of specific receptors to be identified for the prediction of air quality impacts. The link to GIS allows the use of digital map data to initialise the emissions figures, and also provides the best method of analysing the pollution output. The model can be used to draw detailed concentrations contours of pollutant concentrations (via GIS tools) and allow areas of maximum impacts and any areas of exceedences to be identified.

3.1 Model Verification and Adjustment

3.1.1 NO_X/NO_2

Nitrogen dioxide (NO_2) and nitric oxide (NO) are both oxides of nitrogen, and are collectively referred to as nitrogen oxides (NO_X). The main source of NO_X emissions in the UK is vehicle exhausts, which are converted to NO_2, mainly as a result of reaction with ozone in the atmosphere. The ADMS-Roads dispersion model produces modelled results of the NO_X emissions from vehicles and these are then converted to NO_2 for comparison with the Air Quality Objective as outlined below.

Background concentrations, as described in Section 2.3, have been added to the modelled contributions and conversion to NO_2 (in the case of NO_X) has been carried out using a Kent NO_X: NO_2 ratio which has been based on the assessment of data from 10 roadside continuous analysers in Kent. Consideration was made of the influence of background by assessing the Roads NO_X: Roads NO_2 ratio and the Total NO_X: Total NO_2 ratio. The average Roads NO_X: Roads NO_2 ratio was 3.57 (Range = 2.46 – 4.58) and this was more variable and more sensitive to background changes than the Total NO_X: Total NO_2 ratio which performed the best in the model verification. The average Total NO_X: Total NO_2 ratio of 2.56 has been used in the assessment, as shown in Table 6. The conversion method in LAQM.TG (03) was also undertaken for comparison purposes, but the use of local data to establish a Kent-wide factor was found to perform much better. The performance criterion is based on comparisons with monitored data.

For background sites, the average total NO_X: NO_2 ratio in Kent was found to be 1.71. This ratio has been used to convert local background NO_2 data to NO_X.

Table 6 NO_X: NO_2 Roadside Conversion Factors

Location	NO_X: NO_2 ratio	Average
Ashford Roadside	2.36	**2.56**
Dartford Greenhithe Roadside	2.69	
Dartford Town Centre Roadside	2.60	
Dartford Bean Roadside	2.52	
Dover High Street	2.38	
Dover Townwall Street	2.28	
Gravesham A2 Roadside	2.88	
Maidstone Roadside	2.49	
Tonbridge High Street	2.72	
Swale Ospringe Roadside	2.66	
Swale Sheerness Background	1.79	**1.71**
Gravesham Northfleet Background	1.69	
Tunbridge Wells Background	1.65	

Model verification for NO_X has been performed against 42 roadside sites and 10 trunk road monitoring sites in Kent, including the three roadside air quality stations and seven diffusion tube sites within the Dartford assessment areas. Two NO_X correction factors have been established for correction of the modelled roadside component for urban roadside (3.9) and for trunk roads (1.4), as summarised in Table 7. The model was found to perform best for modelled trunk road NO_X contributions. Comparison with background sites showed the model was likely to overestimate the NO_X contribution and will therefore be precautionary.

The Kent factor for urban roadsides (3.9) has been used for the assessment areas in this Detailed Assessment, with the exception of A226 London Road (including A226/B255 St Clements Way Junction). While the preference in undergoing verification of dispersion modelling in Kent is to use the Kent factor, due to the large amount of data to draw upon, consideration has also been made to local circumstances. Within the London Road assessment area, the long-term roadside continuous monitoring site to the junction (to the northeast where the maximum model predicted concentrations occur) indicates that a local roads NO_X correction factor would be 2.3, approximately half the Kent factor. The use of a local factor in this instance is suitably robust and provides a more realistic approach to verification, as the Kent factor is overly conservative, yielding results >10μg/m^3 above the monitored data.

Table 7 Roadside Component NO_X Correction Factor

Kent roads NO_X correction factor	Ave	Min	Max
Major Trunk Road	1.4	0.8	2.1
Urban Roadside	3.9	1.57	6.57
Background	*-0.7*	*-2.3*	*0.6*

The full verification process is shown in Appendix 2.

3. 1.2 PM_{10}

ADMS-Roads model has been used to predict the contribution of the road network to annual mean PM_{10} at automatic analyser sites in Kent in order to verify predicted concentrations so they are inline with concentrations currently existing in the assessment area. The results from three sites, as shown in table 8 below, indicate that ADMS-Roads is underestimating concentrations and is not performing as well with PM_{10}, when compared to the predictions of NO_X. The road contribution correction factor is also very variable (between 10.8 – 49) making it difficult to establish an average Kent factor for PM_{10}.

There is a local PM_{10} monitoring site within the assessment area to establish a local verification factor. This site performs the best of the three sites (x10.8), and has been used to correct the modelled PM_{10} data.

Table 8 PM_{10} Modelled Road Contribution in $\mu g/m^3$

Location	PM_{10} annual mean (modelled)	PM_{10} Road Contribution	PM_{10} background	PM_{10} annual mean (monitored)	PM_{10} Road correction factor
Dartford Greenhithe Roadside	24.65	2.55	22.10	49.60	10.8
Maidstone Roadside	22.33	0.23	22.10	33.40	49.0
Dover Townwall Street	19.62	0.82	18.80	38.60	24.0

4. RESULTS

Annual average concentrations for NO_2 and 24-hour mean PM_{10} were predicted for the baseline year 2003, 2004 (for PM_{10}) and 2005 (for NO_2) at::

Dartford Town Centre:(Highfield Road/Instone Street) – NO_2 Only
• 20 specific receptors on the facades of buildings along the one-way system through the town centre
• 2210 receptors forming a regular 10m grid across the assessment area
A226 London Road, including Junction 2 A226/B255 St Clement's Way – NO_2 and PM_{10}
• 55 specific receptors on the facades of buildings along the A226
• 1025 receptors forming a regular 10m grid across the assessment area
A206 University Way - NO_2 Only
• 25 specific receptors on the facades of buildings along the A206 and in close proximity to the junction with Burnham Road
• 1090 receptors forming a regular 10m grid across the assessment area
Junction 1: Bean Interchange – NO_2 only
• 18 specific receptors on the facades of buildings in close proximity to the junction
• 3570 receptors forming a regular 10m grid across the assessment area
Junction 3: A226 East Hill/Park Road and junction 4: A226 The Brent/Watling Street/St Vincent's Road – NO_2 only
• 55 specific receptors on the facades of buildings in close proximity to the junctions
• 6325 receptors forming a regular 10m grid across the assessment area
Junction 5: A225 Lowfield Street/Princes Road – NO_2 only
• 24 specific receptors on the facades of buildings in close proximity to the junction
• 2110 receptors forming a regular 10m grid across the assessment area

All predicted results have been produced using the methodology described in Section 3 of this report. For the prediction of results for the future years 2004 and 2005, the same verification method has been used but projected background data and forecast traffic data and emissions have been used.

4.1 Dartford Town Centre (Highfield Road/Instone Street)

The verified modelled NO_2 annual mean concentrations and projected measured concentrations indicate predicted exceedences within Dartford Town Centre, the highest concentrations being predicted at receptors in Instone Street (Appendix 3:Figure 2).

The highest modelled NO_2 annual mean concentrations were predicted at the building facade of receptors in Instone Street where there is a combination of reduced speeds due to congestion and residential exposure within 10m of the kerbside. The maximum predicted NO_2 annual mean concentration in 2005 was 48.7μg/m$^{3.}$ (grid reference x=553897, y=173874). This is above the annual mean Objective of 40 μg/m^3.

Projected monitoring results for 2005 for the continuous monitoring site on Instone Street, show maximum levels in 2005 of 53.3μg/m^3. Exceedences of the NO_2 annual mean Objective are therefore considered likely.

4.2 A226 London Road and Junction 2: A226/B255 St Clement's Way

The verified modelled NO_2 annual mean concentrations show predicted exceedences of the annual mean Objective; the highest concentrations being predicted at the nearest receptors to the A226/B255 St Clement's Way junction in Ivy Villas (Appendix 3: Figure 12). The maximum predicted concentration in 2005 was 53.9μg/m^3. At the A226 London Road at Ingress Park (Appendix 3: Figure 5) the maximum predicted concentration at the building façade was 43.6μg/m^3.

The verified modelled PM_{10} concentrations show a maximum annual mean concentration in 2004 of 39.2μg/m^3 at the nearest receptor to the A226/B255 St Clement's Way in Ivy Villas, which is below the annual mean PM_{10} Objective.

The number of exceedences of daily mean PM_{10} concentration of 50 μg/m^3 based on relationship defined in LAQM.TG (03) whereby:

No. of exceedences of 50 μg/m^3 daily mean =-18.5 + 0.00145 × (annual mean PM_{10})^3 +(206/annual mean PM_{10})

gives a predicted number of exceedences of 74, which is above the 24-hour mean Objective.

Projected NO_2 monitoring results for the continuous roadside monitoring site at the St Clement's junction indicate levels in 2005 of 62.0μg/m^3. As there are receptors within 10 – 20m of the roadside, exceedences of the NO_2 annual mean Objective are considered likely.

4.3 University Way

The verified modelled NO_2 annual mean concentrations indicate that there is a risk of exceedence of the Objective at the facade of the nearest receptor to the University Way/Burnham Road junction (grid reference x=553272, y=175279). The maximum predicted NO_2 annual mean concentration in 2005 at the nearest receptor was 45.4μg/m^3. The predicted exceedence area is limited to a small number of receptors nearest to the junction (Appendix 3: Figure 7).

There are no predicted exceedences of the annual mean Objective at the nearest receptors along University Way.

Projected monitoring results for the NO_2 diffusion tube site at the University Way /Burnham Way junction, show maximum levels in 2005 of 52.3μg/m^3. However, the nearest receptors are approximately 40m from the junction and 14m from Burnham Road. It is therefore recommended that monitoring be undertaken at the nearest receptor to demonstrate compliance with the Objective.

4.4 Junction 1: Bean Interchange

The verified modelled NO_2 annual mean concentrations indicate that there may be an exceedence of the Objective at the facade of the nearest receptor to the A2 (grid reference x=558911, y=172744). The maximum predicted NO_2 annual mean concentration in 2005 at the nearest receptor to the A2 was 45.5μg/m^3.

The maximum predicted NO_2 annual mean concentration in 2005 at the nearest receptors (Ightham Cottages) to the Bean Interchange Junction is 42.2μg/m^3, which is above the Objective. (Appendix 3: Figure 9).

It is recommended that monitoring be undertaken at the nearest receptors to demonstrate compliance with the Objective.

4.5 Junction 3*:* A226 East Hill/Park Road and Junction 4: A226 The Brent/Watling Street

The verified modelled NO_2 annual mean concentrations indicate that there are likely to be exceedences of the Objective at the facade of the nearest receptors to the north of the A226 East Hill/Park Road junction (Appendix 3: Figure 14). The maximum predicted NO_2 annual mean concentration in 2005 was 40.9μg/m^3. There is currently no monitoring at this junction to confirm model predictions, however as there are receptors within 5m of the roadside there is a risk of exceedence of the Objective. It is recommended that NO_2 monitoring be undertaken at the nearest receptors where the maximum predicted concentrations occur to demonstrate compliance with the Objective.

The verified modelled NO_2 annual mean concentrations indicate that there are likely to be exceedences of the Objective at the facade of the nearest receptors to the northwest of the A226 The Brent/Watling Street/St Vincent's Road junction. The maximum predicted NO_2 annual mean concentration in 2005 was 49.5μg/m^3. This Junction is in close proximity to the A282 AQMA and therefore is influenced by emissions from the A282, in addition to emissions from the local road network. There is currently no monitoring at this junction to confirm model predictions, however as there are receptors within 5 - 10m of the roadside there is a risk of exceedence of the Objective. It is recommended that NO_2 monitoring be undertaken at the nearest receptors where the maximum predicted concentrations occur to demonstrate compliance with the Objective.

4.6 Junction 5: A225 Lowfield Street/Princes Road

The verified modelled NO_2 annual mean concentrations indicate that there are likely to be exceedences of the Objective at the facade of the nearest receptors to the northwest of the junction. The maximum predicted concentration in 2005 was 54.4μg/m^3 (Appendix 3: Figure 16).

Projected monitoring results for 2005 for the roadside NO_2 diffusion tube site at this junction, show maximum levels in 2005 of 53.3μg/m^3. As there are receptors at the junction within 10m of the roadside, exceedences of the Objective are therefore considered likely. It is recommended that monitoring be undertaken at the nearest receptor to demonstrate compliance with the Objective.

5. CONCLUSIONS AND RECOMMENDATIONS

Verified modelled results of the assessment areas for road traffic emissions in 2005 indicate annual mean nitrogen dioxide concentrations at relevant receptor locations will exceed the annual objective of 40μg/m^3. The highest predicted concentrations being predicted at the nearest receptor to the A225 Lowfield Street/Princes Road Junction.

To account for random model error, the Technical Guidance LAQM.TG (03) suggests predicted concentrations above 36μg/m^3 may exceed the objective limit. As the approach has been precautionary and model verification has been based on monitoring in a poor air quality year, to add an error factor may be overly precautionary. However, the Council is minded to consider such errors when deciding whether to declare an AQMA.

In order to facilitate the declaration of an AQMA, separate contour lines have been drawn representing the Objective and model uncertainty levels for NO_2. The Council will need to confirm that the exposure criteria with respect to the Objectives are fulfilled before defining the extent of any AQMA(s).

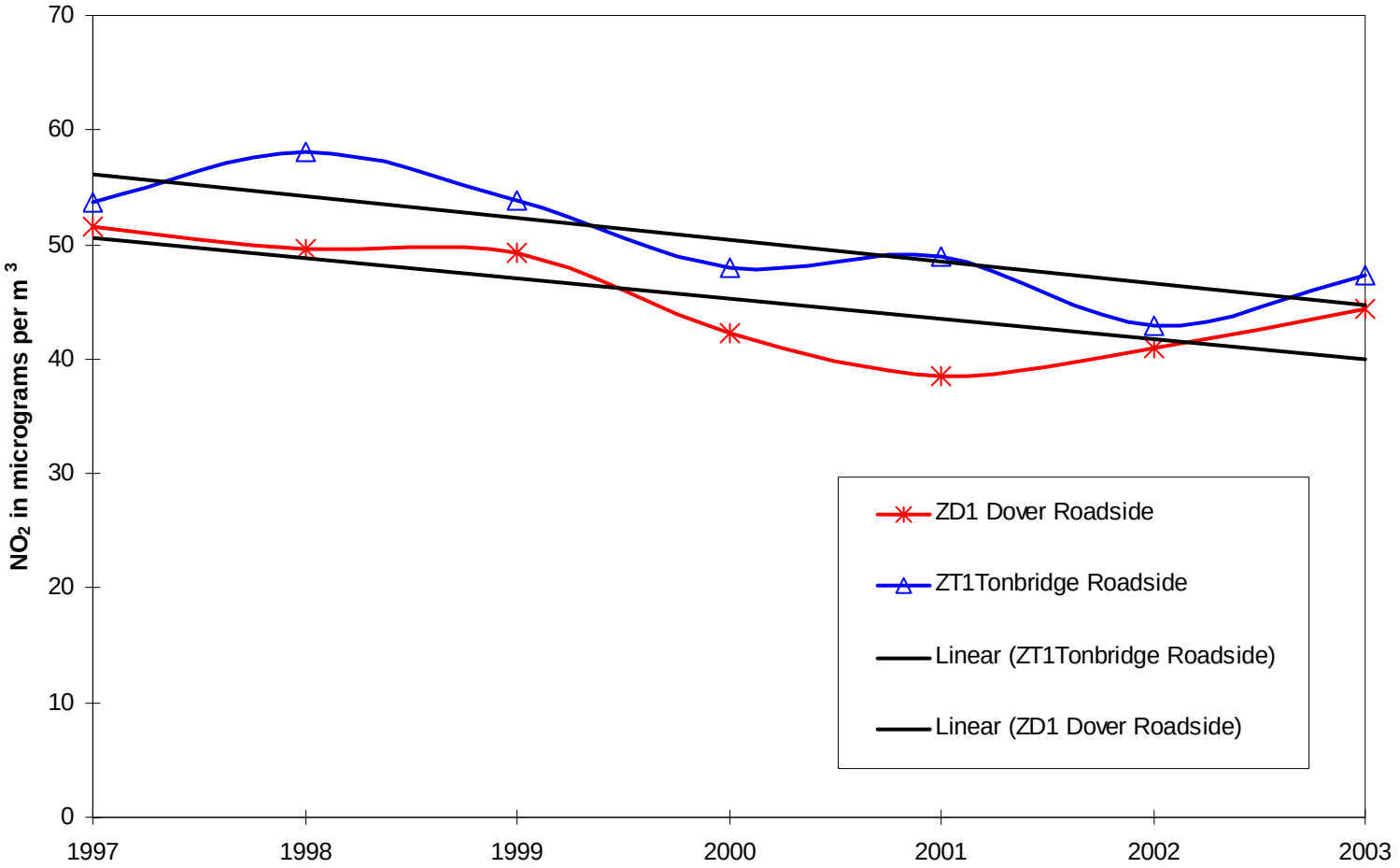
There were predicted exceedences of the Objective within one standard deviation (i.e. within model error) 10% of the Objective in 2005 at the nearest receptor to Bean Interchange (Ightham Cottages), A226 East Hill/Park Road junction and A226 London Road/Ingress Park junction. As the approach has been precautionary, it is recommended that NO_2 monitoring be undertaken at the nearest receptor locations where the highest modelled concentrations are predicted to demonstrate compliance with the Objective. There are predicted exceedences at the nearest receptors to the University Way/Burnham Road junction, but consideration of the receptor distance would suggest that the model is being overly precautionary and the drop off in concentration from the junction is underestimated. It is therefore recommended that monitoring be undertaken at the nearest receptor to demonstrate compliance with the Objective.

It is also recommended that NO_2 monitoring be undertaken at receptors with the highest predicted concentrations in the other assessment areas to provide additional information in support of further assessment work. As there is already an extensive kerbside monitoring programme within the Borough, it may be advisable to rationalise the existing sites to concentrate on receptor-based monitoring at these pollution hotspots.

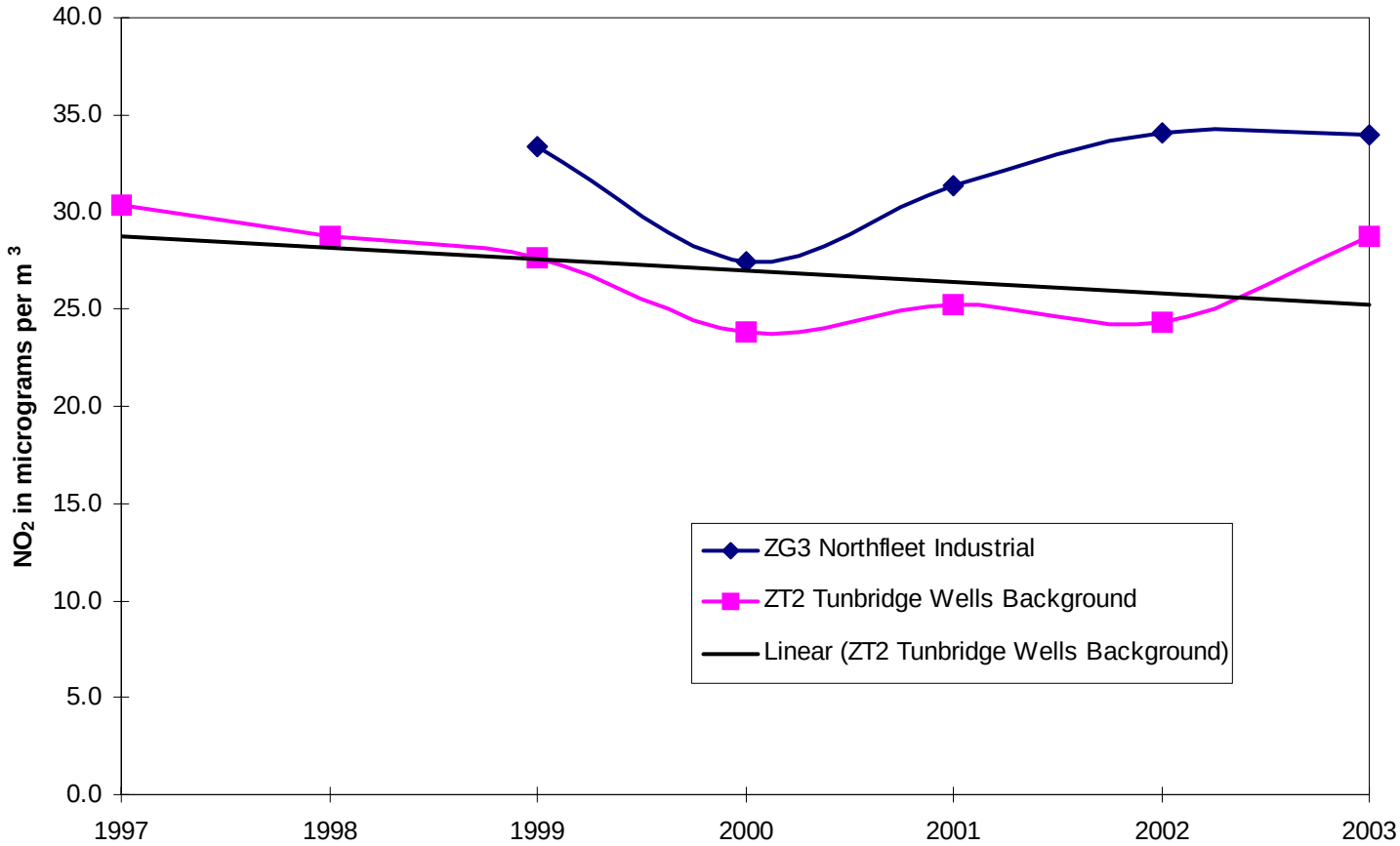
It is recommended that Dartford Borough Council consider declaring Air Quality Management Areas (AQMA) on the basis of the potential exceedences in the assessment areas highlighted in this Detailed Assessment Report where exposure criteria are fulfilled.

6. APPENDIX 1 MONITORING TRENDS

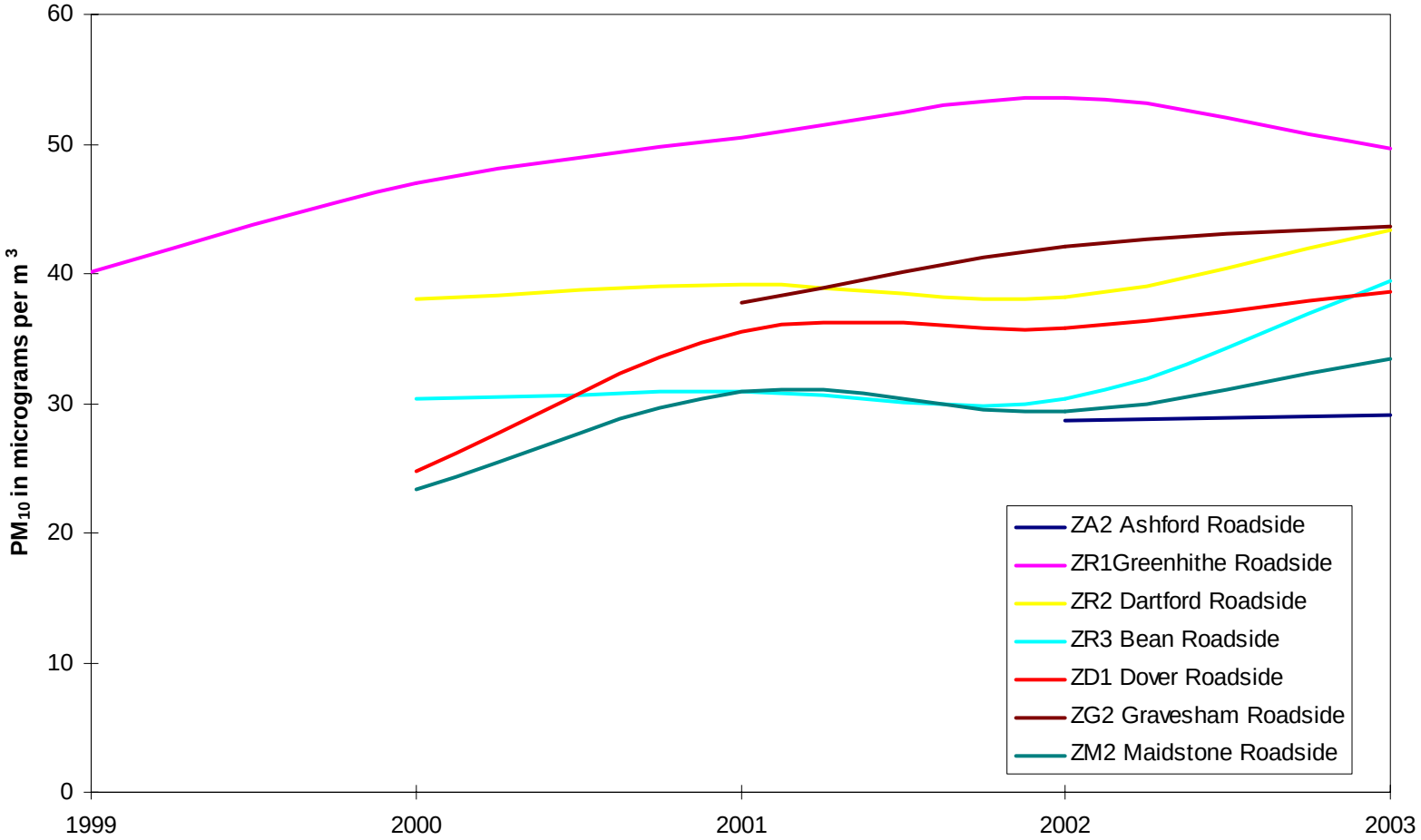
6.1 NO_2 Annual mean in micrograms per m^3: Kent Roadside Sites 1997 - 2003



6.2 NO_2 Annual mean in micrograms per m^3: Kent Background Sites 1997 - 2003



6.3 PM_{10} Annual mean in micrograms per m^3: Kent Roadside Sites



6.4 Continuous Monitoring Station Results

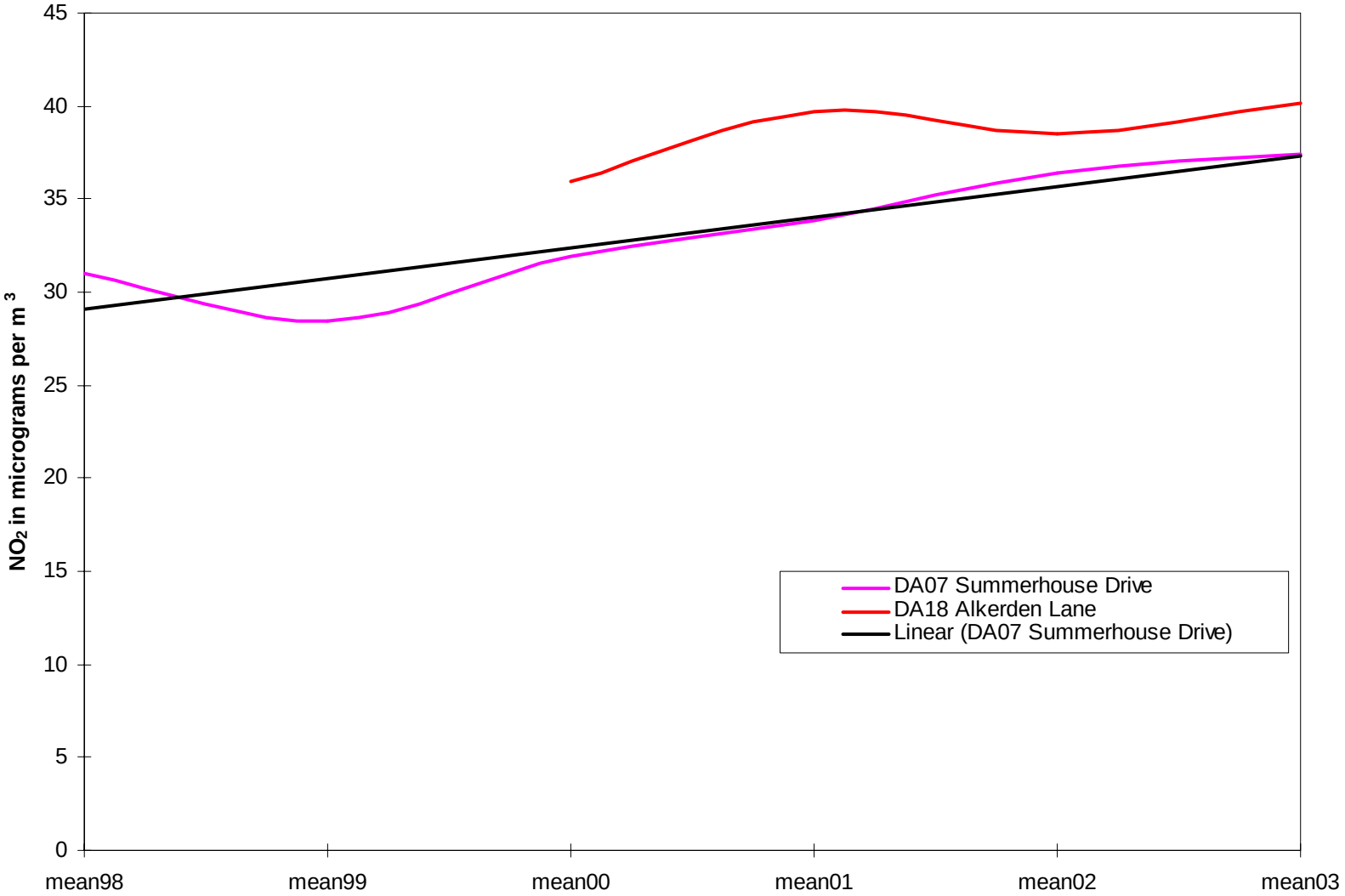
Annual mean NO_2 in $\mu g/m^3$

Site No.	Location	1997	1998	1999	2000	2001	2002	2003
ZA2	Ashford roadside	-	-	-	-	-	34.1	36.3
ZR1	Greenhithe roadside	-	-	65.1	65.2	61.5	59.5	65.4
ZR2	Dartford roadside	-	-	-	43.9	48.0	47.6	56.2
ZR3	Bean roadside	-	-	-	57.3	59.3	50.2	60.0
ZD1	High Street/Ladywell Dover roadside	51.6	49.7	49.3	42.2	38.5	41.0	44.5
ZG2	Gravesham A2 roadside	-	-	50.4	60.7	50.8	50.4	52.8
ZG3	Northfleet Industrial	-	-	33.3	27.4	31.4	34.1	34.0
ZM2	Maidstone roadside	-	-	49.4	48.4	50.8	45.8	49.3
ZT1	Tonbridge roadside	53.6	58.0	53.9	48.0	49.0	42.9	47.4
ZT2	Tunbridge Wells urban background	30.4	28.8	27.7	23.8	25.2	24.4	28.7

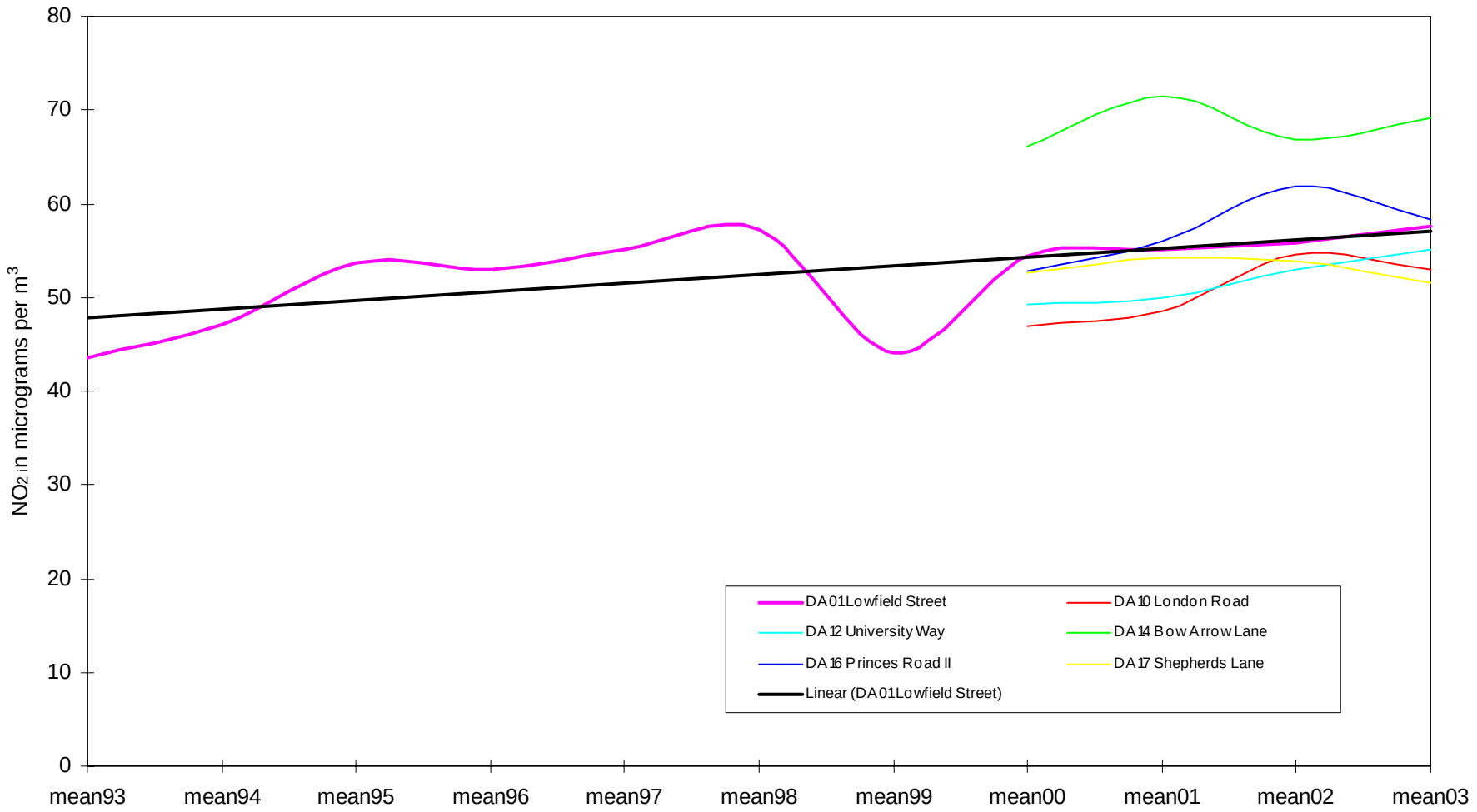
Annual mean PM_{10} in $\mu g/m^3$

Site No.	Location	1999	2000	2001	2002	2003
ZA2	Ashford roadside	-	-	-	28.7	29.1
ZR1	Greenhithe roadside	40.1	47.0	50.5	53.5	49.6
ZR2	Dartford Town centre roadside	-	38.0	39.1	38.2	43.4
ZR3	Bean roadside	-	30.3	30.9	30.4	39.4
ZD2	Dover roadside	-	24.7	35.5	35.9	38.6
ZG1	Gravesham A2 roadside	50.4	-	37.8	42.1	43.6
ZG2	Northfleet Industrial	48.6	-	41.9	43.4	46.4
ZM2	Maidstone roadside	-	23.3	31.0	29.4	33.4

6.5 Dartford NO_2 Diffusion Tube Background (Bias Corrected) Annual Mean Results 1998 - 2003



6.6 Dartford NO_2 Diffusion Tube Roadside (Bias Corrected) Results 1993 – 2003



7. APPENDIX 2 VERIFICATION OF NO_X/NO_2

The ADMS-Roads model has been used to predict the contribution of the road network to annual mean NO_X at roadside diffusion tubes sites to verify predicted concentrations. The following information is required:

Urban Roadside Sites

Annual Mean Concentrations ($\mu g/m^3$)	Total Monitored NOx (1)	Total Monitored NO_2 (2)	Background NOx (3)	Monitored Roadside NOx Contribution (1) – (3)	Modelled Roadside Contribution NO_X (from ADMS-Roads)
Maidstone Roadside Station	122.7	49.3	56.0	66.7	42.5
Gravesham GR39	111.8	43.7	60.2	51.6	28.8
Tonbridge & Malling TN14	119.3	46.6	65.0	54.3	28.0
Maidstone Maid 01	116.2	45.4	56.0	60.2	30.6
Gravesham GR36	132.4	51.7	62.1	70.3	35.4
Dartford Greenhithe Station	175.8	65.4	65.0	110.8	47.7
Tonbridge & Malling TN18	102.7	40.1	69.5	33.2	14.0
Gravesham GR46	119.3	46.6	62.0	57.3	24.0
Maidstone Maid 27	134.3	52.4	56.0	78.3	32.3
Maidstone Maid 26	119.4	46.6	56.0	63.4	25.9
Maidstone Maid 30	194.3	75.9	56.0	138.3	56.0
Gravesham GR34	121.1	47.3	63.2	57.9	21.3
Dartford DA16	149.5	58.4	71.8	77.7	27.7
Maidstone Maid 29	112.9	44.1	56.0	56.9	19.6
Gravesham GR24	125.6	49.1	60.2	65.4	21.3
Tonbridge & Malling TN20	106.0	41.4	36.7	69.3	20.8
Tonbridge & Malling TN07	127.5	52.6	35.7	91.8	26.8
Gravesham GR38	119.6	46.7	61.5	58.1	16.3
Dartford DA10	141.3	55.2	65.0	76.3	21.3
Dover Town Centre Station	105.8	44.5	28.2	77.6	20.7
Gravesham GR30	131.1	51.2	62.0	69.1	16.0
Ashford - Canterbury Road	140.3	54.8	46.2	94.1	21.6
Tonbridge & Malling TN17	134.3	52.5	69.5	64.8	14.6
Gravesham GR42	132.9	51.9	62.0	70.9	15.9
Gravesham GR43	140.5	54.9	62.0	78.5	17.1
Tonbridge & Malling TN22	140.5	54.9	36.7	103.8	22.5
Tonbridge & Malling TN08	99.4	41.0	35.7	63.7	13.7
Gravesham GR31	144.3	56.4	60.2	84.1	17.6
Gravesham GR44	113.7	44.4	63.2	50.5	10.4
Tonbridge Roadside Station	129.0	47.4	35.7	93.3	19.1
Gravesham GR27	130.5	51.0	60.2	70.3	14.3
Tonbridge & Malling TN21	107.3	41.9	36.7	70.6	14.0
Dartford DA31	120.1	46.9	65.0	55.1	10.8
Gravesham GR26	122.4	47.8	60.2	62.3	12.0
Tonbridge & Malling TN19	139.5	54.5	36.7	102.8	19.2
Dartford Town Centre Station	146.5	56.2	68.0	78.5	14.7
Gravesham GR41	140.0	54.7	62.0	78.0	14.5
Gravesham GR40	138.2	54.0	60.2	78.0	14.3
Gravesham GR33	130.6	51.0	63.2	67.4	12.1
Gravesham GR37	119.1	46.5	62.1	57.0	10.1
Gravesham GR35	135.6	53.0	61.5	74.1	12.7
Gravesham GR15	154.1	51.0	60.2	93.9	14.3

Major Trunk Road Sites

Annual Mean Concentrations (µg/m³)	Total Monitored NOx (1)	Total Monitored NO_2 (2)	Background NOx (3)	Monitored Roadside NOx Contribution (1) – (3)	Modelled Roadside Contribution NOx (from ADMS-Roads)
Maidstone Maid11	79.6	31.1	58.0	21.6	27.7
Maidstone Maid13	113.4	44.3	58.0	55.4	59.2
Maidstone Maid12	90.6	35.4	58.0	32.6	33.1
Maidstone Maid14	84.5	33.0	58.0	26.5	26.0
Dartford DA22	168.3	65.7	72.0	96.3	91.1
Ashford - Nutley Close	79.2	31.0	46.2	33.1	26.9
Dartford Bean Station	151.4	60.0	56.3	95.1	55.5
Dartford DA21	137.1	53.6	72.0	65.2	36.6
Ashford - Hill View	90.9	35.5	46.2	44.7	21.0
Maidstone Maid24	100.4	39.2	58.0	42.4	19.8

The modelled roadside NOx from ADMS-Roads is first compared against the monitored roadside NOx, and the average correction factor at each monitoring site is calculated thus:

Major Trunk Road Sites (continued)

Annual Mean Concentrations (µg/m³)	Monitored Roadside NOx / Modelled Roadside NOx Contribution	Average Correction Factor Modelled Roadside NOx
Maidstone Maid11	0.8	1.4
Maidstone Maid13	0.9	
Maidstone Maid12	1.0	
Maidstone Maid14	1.0	
Dartford DA22	1.1	
Ashford - Nutley Close	1.2	
Dartford Bean Station	1.7	
Dartford DA21	1.8	
Ashford - Hill View	2.1	
Maidstone Maid24	2.1	

Urban Roadside Sites

Annual Mean Concentrations (μg/m³)	Monitored Roadside NOx / Modelled Roadside NOx Contribution	Average Correction Factor Modelled Roadside NOx
Maidstone Roadside Station	1.6	3.9
Gravesham GR39	1.8	
Tonbridge & Malling TN14	1.9	
Maidstone Maid 01	2.0	
Gravesham GR36	2.0	
Dartford Greenhithe Station	2.3	
Tonbridge & Malling TN18	2.4	
Gravesham GR46	2.4	
Maidstone Maid 27	2.4	
Maidstone Maid 26	2.5	
Maidstone Maid 30	2.5	
Gravesham GR34	2.7	
Dartford DA16	2.8	
Maidstone Maid 29	2.9	
Gravesham GR24	3.1	
Tonbridge & Malling TN20	3.3	
Tonbridge & Malling TN07	3.4	
Gravesham GR38	3.6	
Dartford DA10	3.6	
Dover Town Centre Station	3.7	
Gravesham GR30	4.3	
Ashford - Canterbury Road	4.4	
Tonbridge & Malling TN17	4.4	
Gravesham GR42	4.5	
Gravesham GR43	4.6	
Tonbridge & Malling TN22	4.6	
Tonbridge & Malling TN08	4.6	
Gravesham GR31	4.8	
Gravesham GR44	4.9	
Tonbridge Roadside Station	4.9	
Gravesham GR27	4.9	
Tonbridge & Malling TN21	5.0	
Dartford DA31	5.1	
Gravesham GR26	5.2	
Tonbridge & Malling TN19	5.3	
Dartford Town Centre Station	5.4	
Gravesham GR41	5.4	
Gravesham GR40	5.5	
Gravesham GR33	5.6	
Gravesham GR37	5.6	
Gravesham GR35	5.8	
Gravesham GR15	6.6	

The average correction factor for modelled roadside NO_X is then applied to the original modelled roadside NO_X contribution and background NO_X is added back in to get the new total modelled NO_X concentration.

Urban Roadside Sites

Annual Mean Concentrations (µg/m³)	Modelled Roadside NOx x Average Correction Factor + background NOx = Modelled Total NOx
Maidstone Roadside Station	221.7
Gravesham GR39	172.5
Tonbridge & Malling TN14	174.2
Maidstone Maid 01	175.2
Gravesham GR36	200.3
Dartford Greenhithe Station	251.2
Tonbridge & Malling TN18	123.9
Gravesham GR46	155.5
Maidstone Maid 27	181.9
Maidstone Maid 26	156.8
Maidstone Maid 30	274.3
Gravesham GR34	146.2
Dartford DA16	179.9
Maidstone Maid 29	132.4
Gravesham GR24	143.3
Tonbridge & Malling TN20	118.0
Tonbridge & Malling TN07	140.1
Gravesham GR38	125.0
Dartford DA10	148.0
Dover Town Centre Station	109.0
Gravesham GR30	124.2
Ashford - Canterbury Road	130.3
Tonbridge & Malling TN17	126.4
Gravesham GR42	123.8
Gravesham GR43	128.5
Tonbridge & Malling TN22	124.3
Tonbridge & Malling TN08	89.2
Gravesham GR31	128.7
Gravesham GR44	103.6
Tonbridge Roadside Station	110.1
Gravesham GR27	115.9
Tonbridge & Malling TN21	91.4
Dartford DA31	107.3
Gravesham GR26	107.1
Tonbridge & Malling TN19	111.7
Dartford Town Centre Station	125.2
Gravesham GR41	118.4
Gravesham GR40	115.8
Gravesham GR33	110.5
Gravesham GR37	101.5
Gravesham GR35	111.2
Gravesham GR15	115.9

Major Trunk Road Sites

Annual Mean Concentrations (μg/m³)	Modelled Roadside NOx x Average Correction Factor + background NOx = Modelled Total NOx
Maidstone Maid11	96.7
Maidstone Maid13	140.9
Maidstone Maid12	104.3
Maidstone Maid14	94.4
Dartford DA22	199.5
Ashford - Nutley Close	83.8
Dartford Bean Station	133.9
Dartford DA21	123.1
Ashford - Hill View	75.6
Maidstone Maid24	85.7

The equation from LAQM.TG(03) for the conversion of NOx to NO_2 has been used to calculate the concentration of NO_2.

Major Trunk Road Sites

Annual Mean Concentrations (μg/m³)	Conversion of Modelled Total NOx to NO_2 using LAQM.TG(03)	[Modelled NO_2 – monitored NO_2]/monitored NO_2 x 100	Average % Difference between modelled and monitored NO_2
Maidstone Maid11	37.8	21.5	4.2
Maidstone Maid13	55.0	24.2	
Maidstone Maid12	40.7	15.1	
Maidstone Maid14	36.9	11.8	
Dartford DA22	77.9	18.6	
Ashford - Nutley Close	32.8	5.8	
Dartford Bean Station	52.3	-12.9	
Dartford DA21	48.1	-10.2	
Ashford - Hill View	29.5	-16.9	
Maidstone Maid24	33.5	-14.6	

Urban Roadside Sites

Annual Mean Concentrations (μg/m³)	Conversion of Modelled Total NOx to NO_2 using Kent NO_X:NO_2 conversion factor	[Modelled NO_2 – monitored NO_2]/monitored NO_2 x 100	Average % Difference between modelled and monitored NO_2
Maidstone Roadside Station	86.6	76.0	
Gravesham GR39	67.4	54.4	
Tonbridge & Malling TN14	68.0	46.0	
Maidstone Maid 01	68.4	50.7	
Gravesham GR36	78.2	51.3	
Dartford Greenhithe Station	98.1	50.0	
Tonbridge & Malling TN18	48.4	20.7	
Gravesham GR46	60.8	30.4	
Maidstone Maid 27	71.1	35.5	
Maidstone Maid 26	61.3	31.3	
Maidstone Maid 30	107.2	41.2	
Gravesham GR34	57.1	20.7	
Dartford DA16	70.3	20.3	
Maidstone Maid 29	51.7	17.2	
Gravesham GR24	56.0	14.1	
Tonbridge & Malling TN20	46.1	11.3	
Tonbridge & Malling TN07	54.7	4.2	
Gravesham GR38	48.8	4.5	
Dartford DA10	57.8	4.8	
Dover Town Centre Station	42.6	-4.2	
Gravesham GR30	48.5	-5.2	1.1
Ashford - Canterbury Road	50.9	-7.1	
Tonbridge & Malling TN17	49.4	-5.8	
Gravesham GR42	48.4	-6.8	
Gravesham GR43	50.2	-8.6	
Tonbridge & Malling TN22	48.6	-11.5	
Tonbridge & Malling TN08	34.8	-14.9	
Gravesham GR31	50.3	-10.8	
Gravesham GR44	40.5	-8.8	
Tonbridge Roadside Station	43.0	-9.3	
Gravesham GR27	45.3	-11.1	
Tonbridge & Malling TN21	35.7	-14.9	
Dartford DA31	41.9	-10.7	
Gravesham GR26	41.8	-12.6	
Tonbridge & Malling TN19	43.6	-20.0	
Dartford Town Centre Station	48.9	-13.1	
Gravesham GR41	46.3	-15.4	
Gravesham GR40	45.2	-16.2	
Gravesham GR33	43.2	-15.4	
Gravesham GR37	39.7	-14.7	
Gravesham GR35	43.4	-18.0	

The method described above has been applied to all modelled concentrations of NO_X at receptors in the study area to convert to NO_2.

8. APPENDIX 3 FIGURES

Figure 1 2003 Annual Mean NO_2 Dartford Town Centre

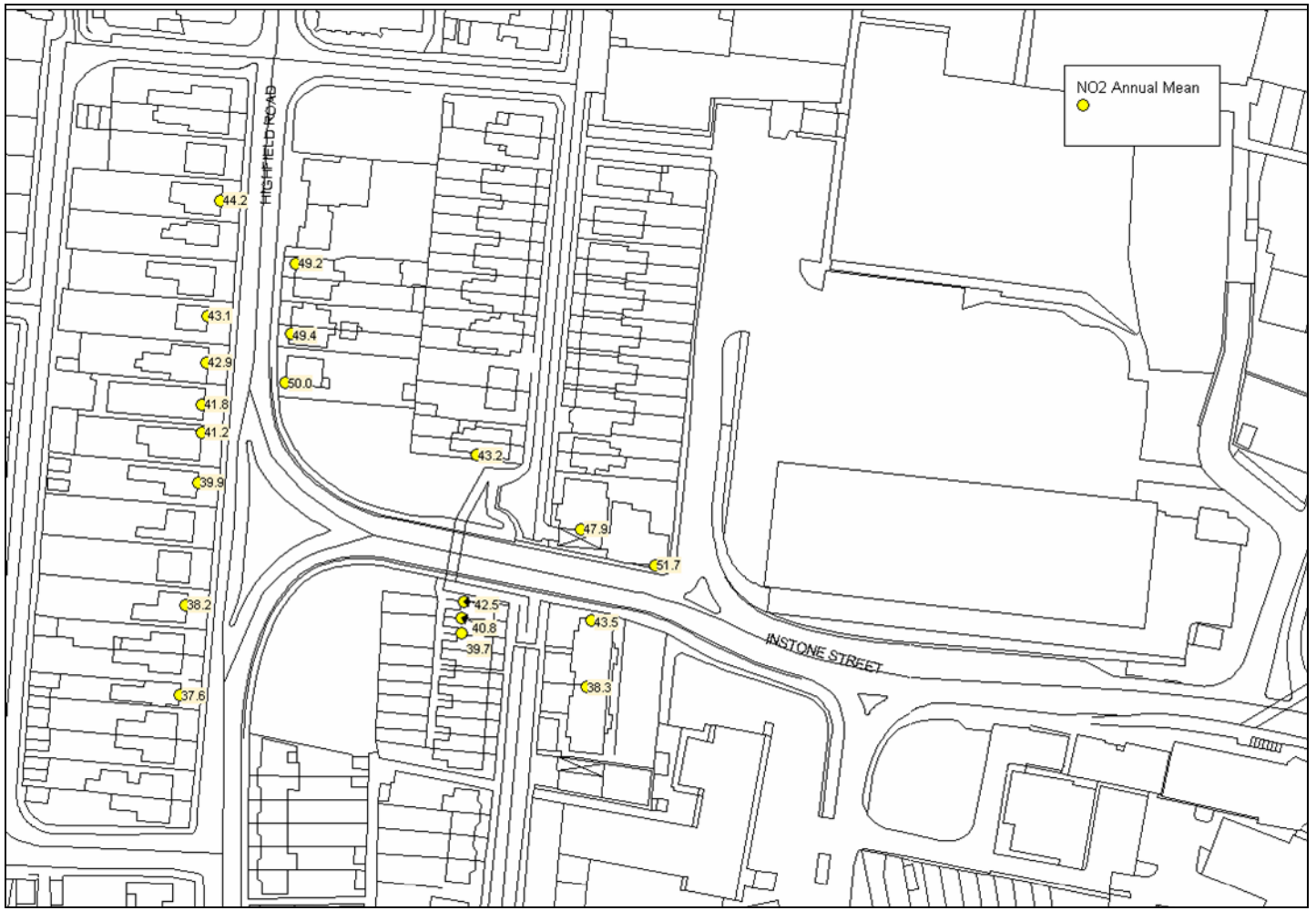


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Figure 2 2005 Annual Mean NO_2 Dartford Town Centre

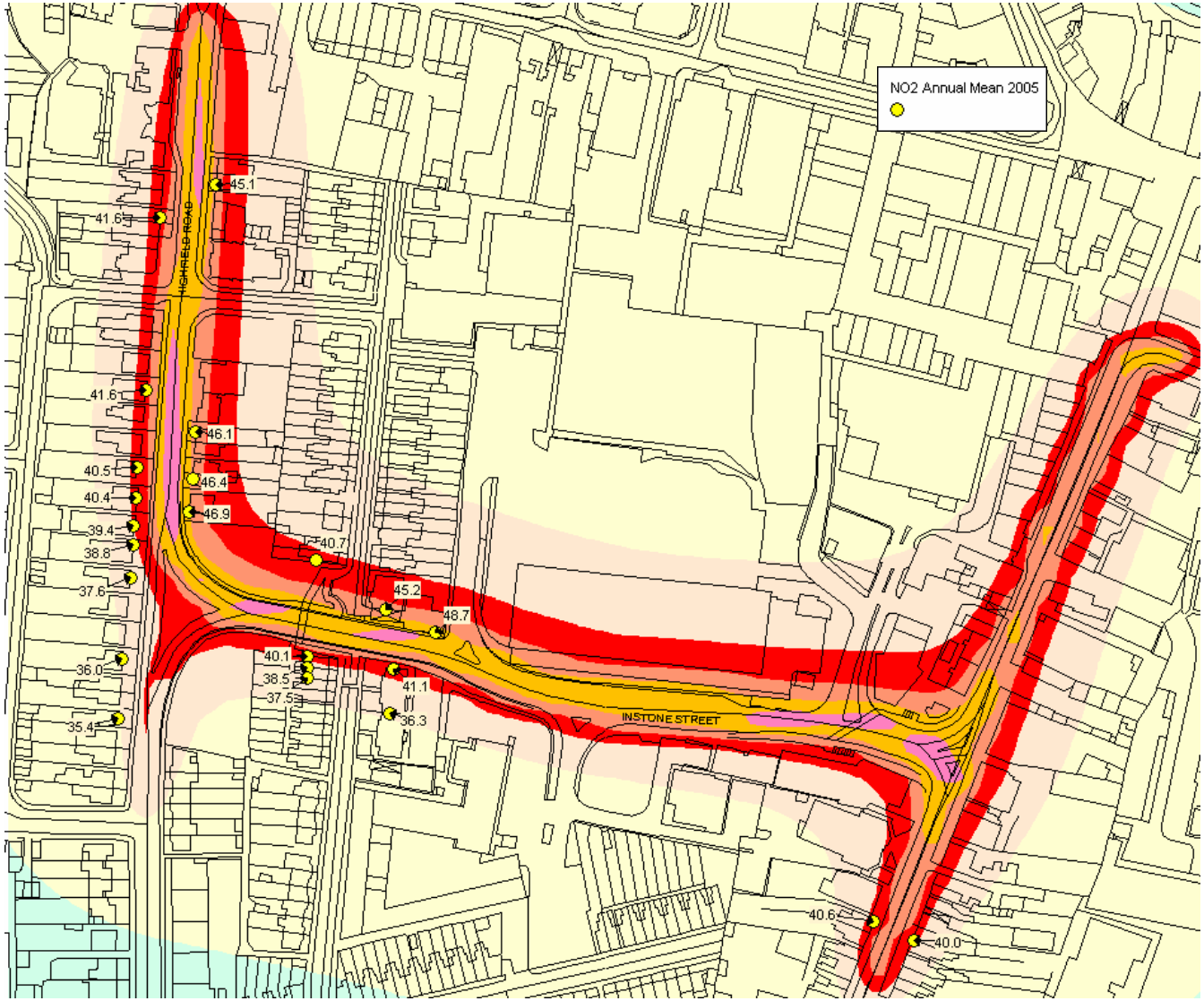
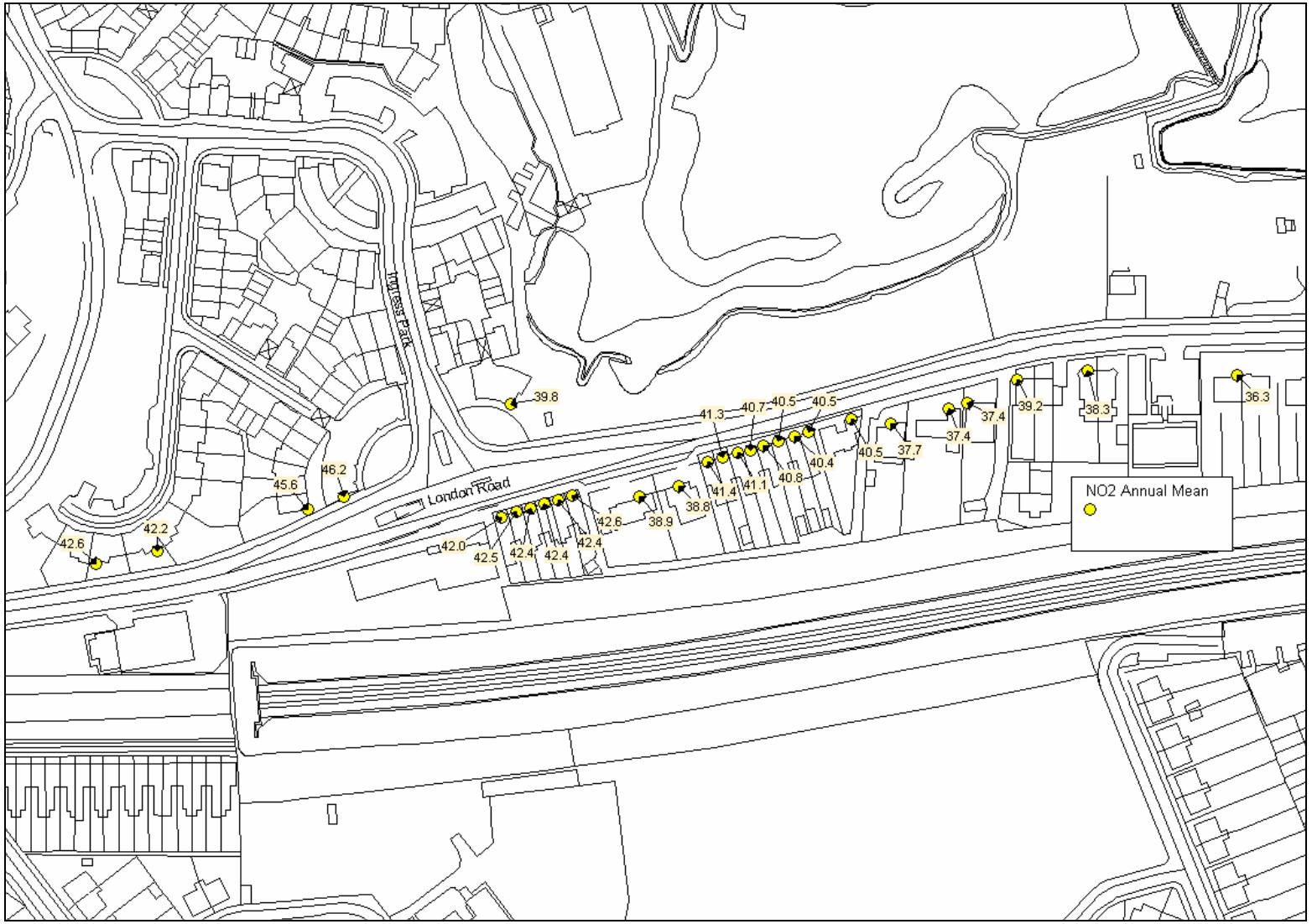


Figure 3 2003 NO_2 Annual Mean A226 London Road



Reproduced from the Ordnance Survey map with the permission of the Controller of Her Majesty's Stationery Office © Crown Copyright 2002. Unauthorised reproduction Infringes Crown Copyright and May lead to prosecution or civil Proceedings. Dartford Borough Council 100025870 2004. Grid reference x1=558980, y1=174920, x2=559250, y2=174830. Scale1: 1500.

Figure 4 2004 PM_{10} No. Exceedences of 50µg/m^3 A226 London Road (maximum allowable of 35)

Figure 5 2005 NO_2 Annual Mean A226 London Road

Figure 6 2003 NO_2 Annual Mean A206 University Way

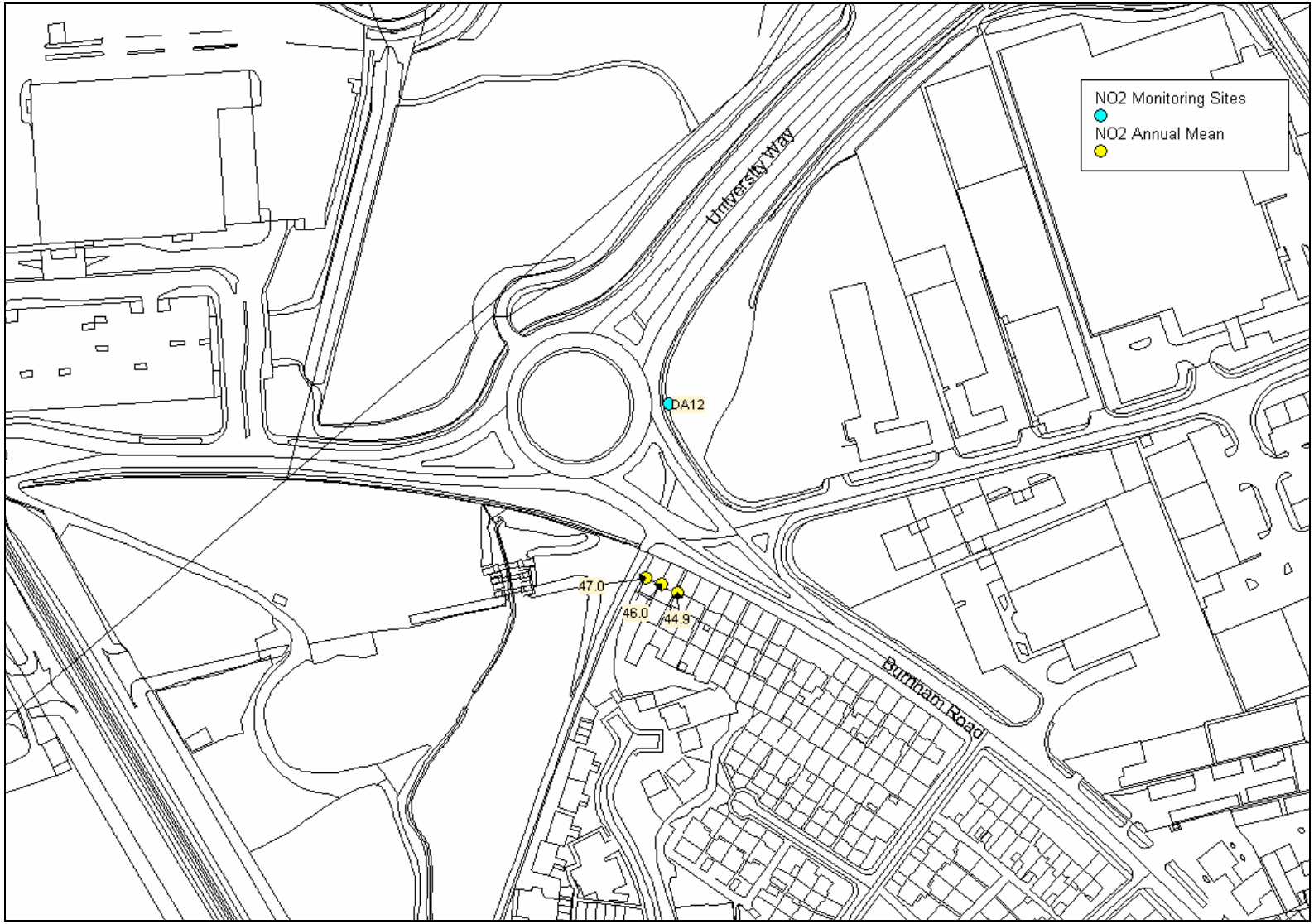


Figure 7 2005 NO_2 Annual Mean A206 University Way

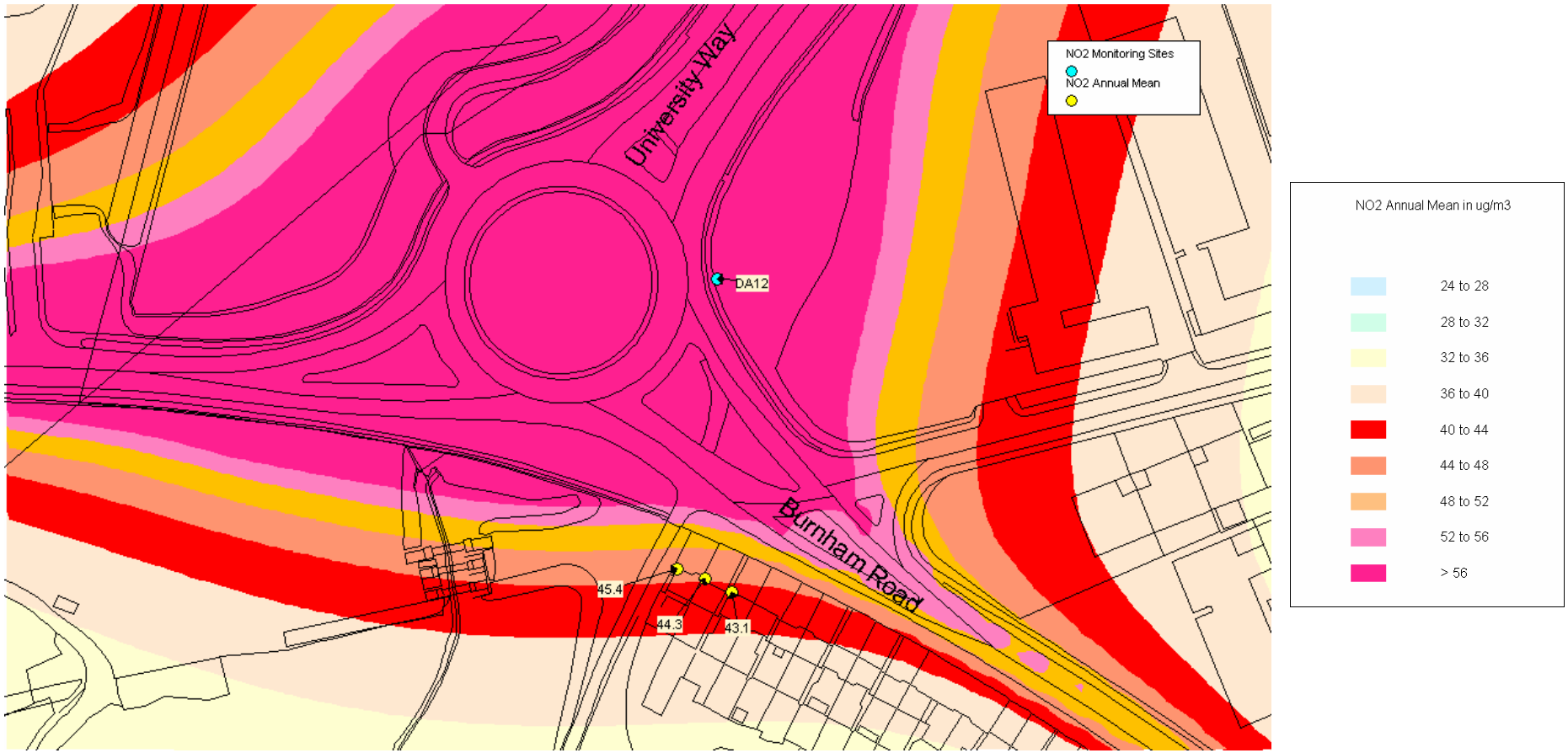


Figure 8 2003 NO_2 Annual Mean Junction 1: Bean Interchange

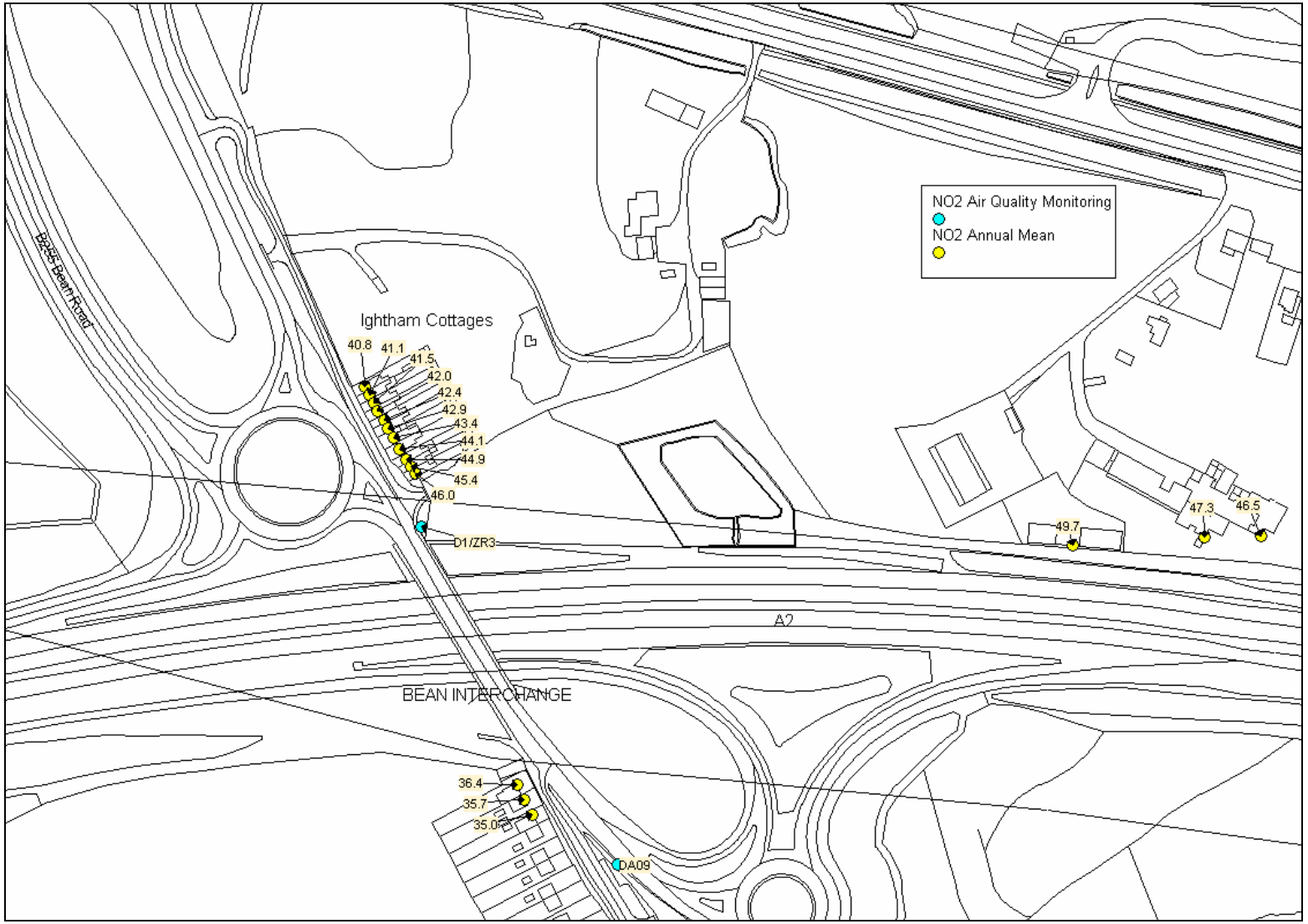


Figure 9 2005 NO_2 Annual Mean Junction 1: Bean Interchange

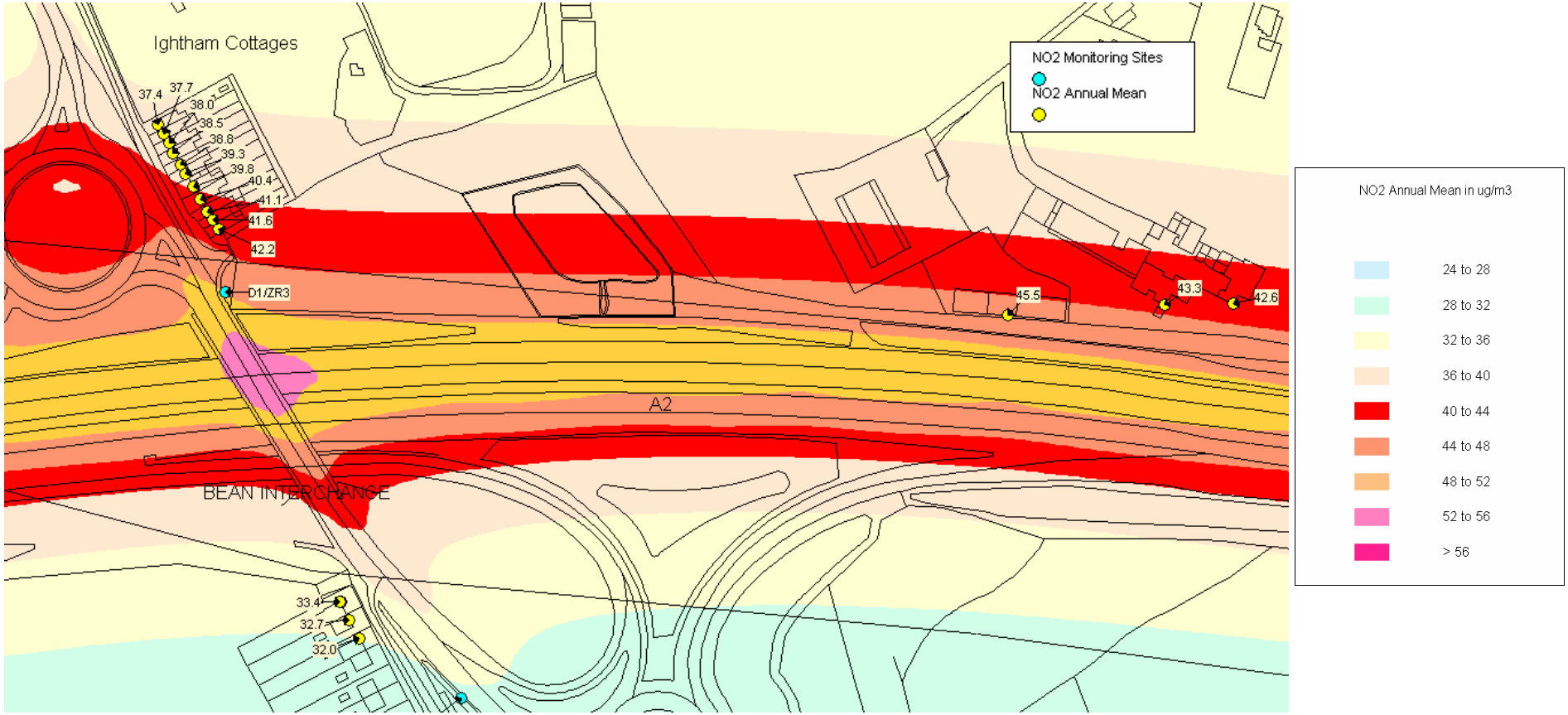


Figure 10 2003 NO_2 Annual Mean Junction 2: St Clement's Way

Figure 11 2004 PM_{10} No. Exceedences of 50µg/m^3 Junction 2: St Clement's Way

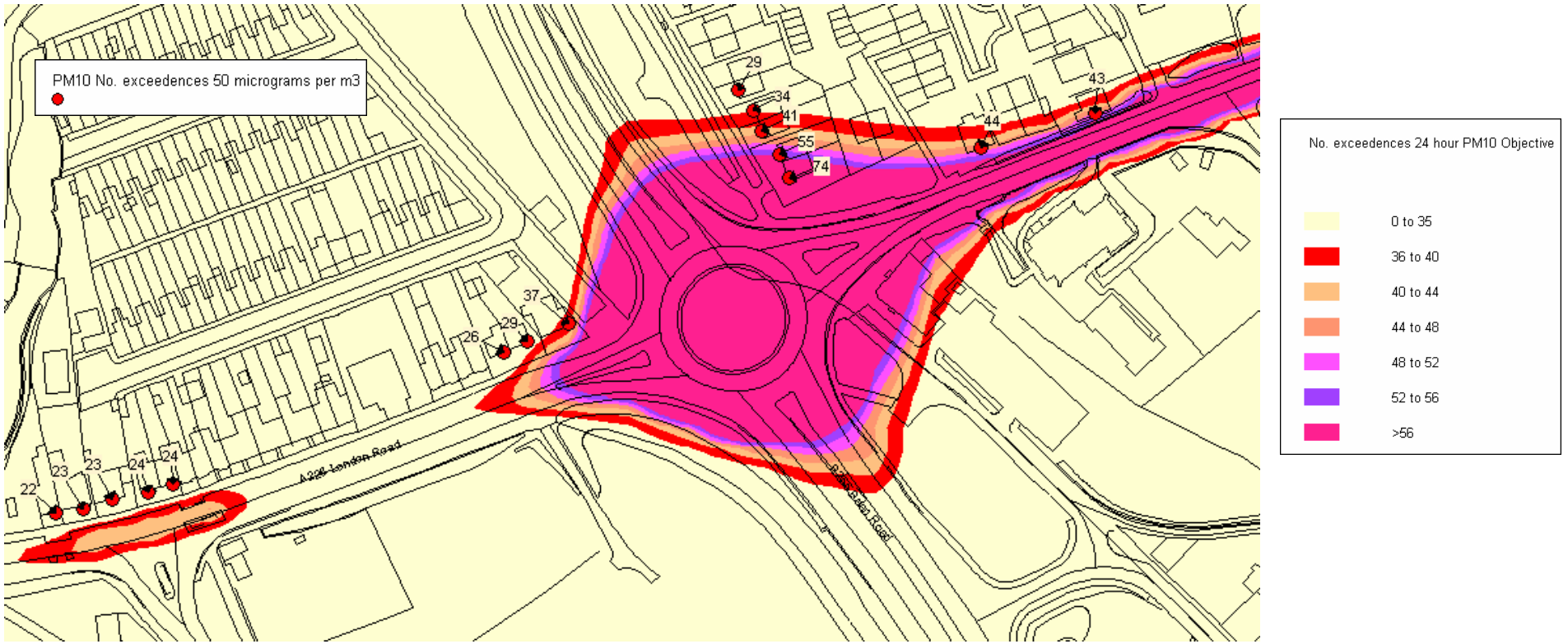


Figure 12 2005 NO_2 Annual Mean Junction 2: St Clement's Way

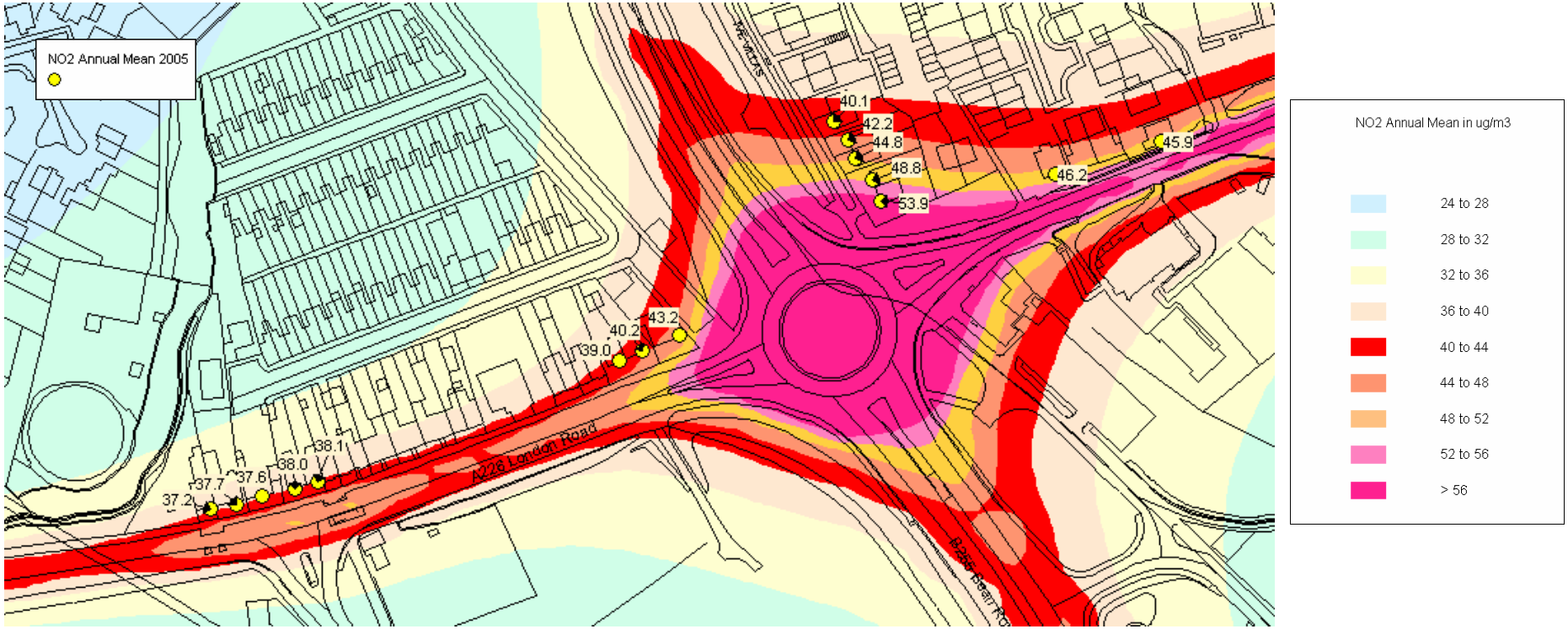


Figure 13 2003 NO_2 Annual Mean Junction 3 & 4: A226 East Hill/Park Road and A226 The Brent/Watling Street

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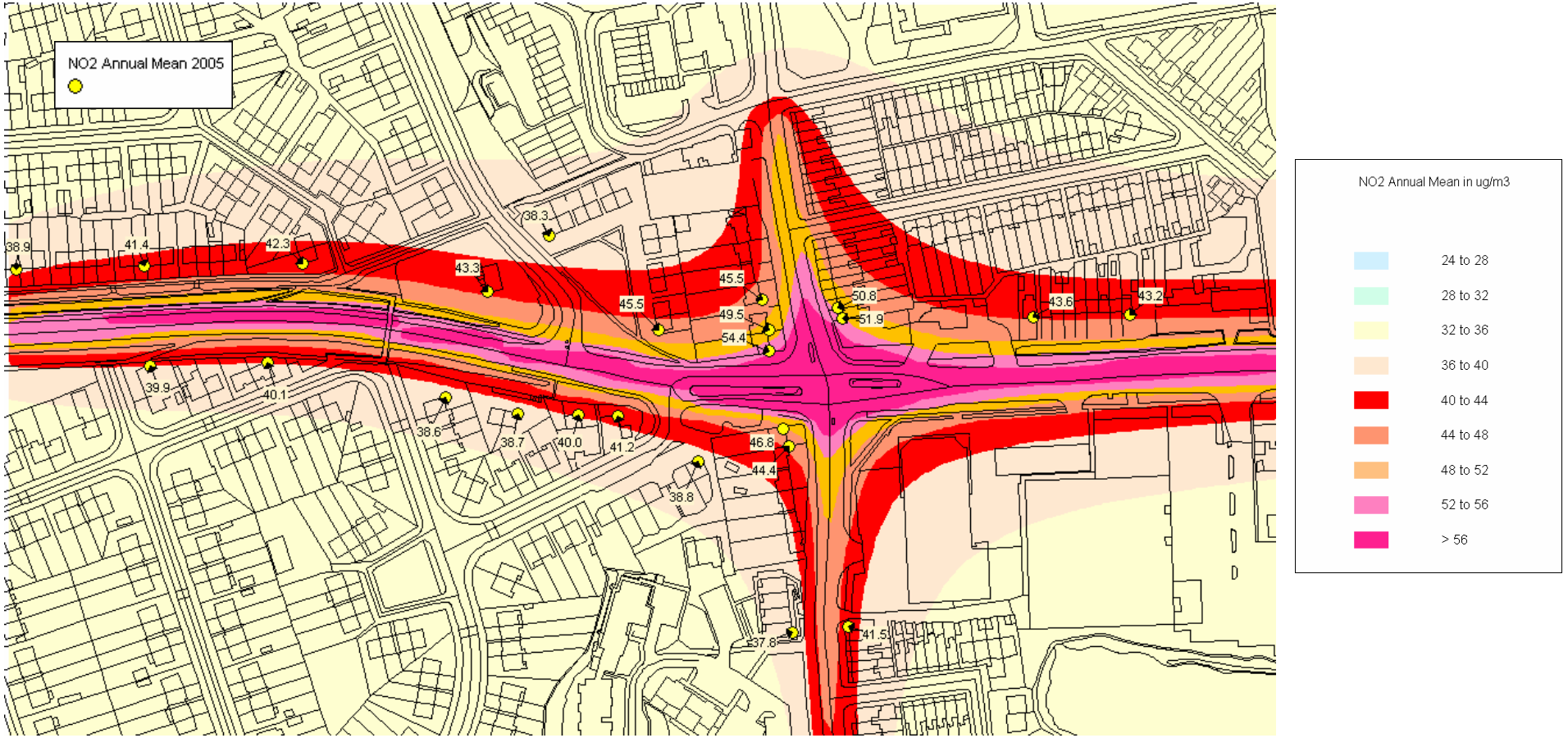
Figure 14 2005 NO_2 Annual Mean Junction 3 & 4: A226 East Hill/Park Road and A226 The Brent/Watling Street

Figure 15 2003 NO_2 Annual Mean Junction 5: A225 Lowfield Street/Princes Road

Figure 16 2005 NO_2 Annual Mean Junction 5: A225 Lowfield Street/Princes Road



Report Statement

Casella Stanger completed this report on the basis of a defined programme of works and within the terms and conditions agreed with the Client. This report was compiled with all reasonable skill and care, bearing in mind the project objectives, the agreed scope of works, prevailing site conditions and degree of manpower and resources allocated to the project as agreed.

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