# Thanet District Council

# Local Air Quality Management – Detailed Assessment Report

**Ref: CS/AQ/AGGX0206/2313**

**February 2005**

## DOCUMENT INFORMATION AND CONTROL SHEET

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|---|---|---|---|---|
| | Draft Report | Issued to client by email | | |
| | Final Report | Issued to client by email and post | | |

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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. The 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 Updating and Screening Assessment (USA) or Annual Progress Reports (APR). The Detailed Assessment has been undertaken in accordance with the Technical Guidance LAQM.TG (03).

Between 1998 and 2000, Thanet District Council undertook its first round of review and assessment of air quality. The first round assessments concluded that UK Air Quality Objectives would be achieved for all pollutants and no further action was required. It was therefore deemed unnecessary to declare an Air Quality Management Area (AQMA) in Thanet at that time.

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 Thanet. The USA concluded that no potential exceedences of the Air Quality Objectives were identified within the District of Thanet. The Annual Progress Report for 2004 considered monitoring data for 2003, which showed significant increases in monitored results due to unusually stable meteorological conditions. The conclusions of the APR were that the annual mean nitrogen dioxide objective may not be met at seven busy junctions, and five of these may also exceed $PM_{10}$ Objectives. These were identified as:

- The Square, Birchington $NO_2/PM_{10}$
- King Street/Boundary Road/Hereson Road, Ramsgate $NO_2/PM_{10}$
- Marine Gardens, Margate $NO_2/PM_{10}$
- The Broadway, Broadstairs $NO_2$
- College Road, Margate $NO_2/PM_{10}$
- Queens Avenue/Ramsgate Road, Margate $NO_2/PM_{10}$
- Haine Road, Ramsgate $NO_2$

Defra accepted Progress Report conclusions.

The Detailed Assessment for road traffic emissions considers the $NO_2$ and $PM_{10}$ Objectives, through dispersion modelling using the ADMS-Roads model. Verification of the model has been undertaken using 2003 monitoring data.

The verified modelled annual mean $NO_2$ results for road traffic emissions in 2005 along The Square, Birchington indicate annual mean nitrogen dioxide concentrations at relevant receptor locations will exceed the annual mean Objective of $40\mu g/m^3$. The predicted $PM_{10}$ concentrations for 2004 within this assessment area also indicate that there is a risk of exceedence of the $PM_{10}$ Objectives. It is therefore recommended that Thanet District Council consider declaration of an AQMA for $NO_2$ and $PM_{10}$ in this area.

The Objectives are expected to be met in the other six areas that underwent detailed assessment.

# 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. The 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 (USA) or subsequent annual progress reports. Casella Stanger was commissioned by Thanet District Council to undertake their Detailed Assessment based on the information received from the local authority and the County Council (through their consultants Jacobs Babtie).

## 1.2 Summary of Review and Assessment

Guidelines for the 'Review and Assessment' of local air quality were published in the 1997 National Air Quality Strategy (NAQS) [1] and associated guidance and technical guidance. 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

Thanet District Council undertook the first round of review and assessment (the 'First Round') between 1998 and 2000. The First Round was a staged 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 ($SO_2$ ). The conclusions of the First Round were that Air Quality Objectives would be met in Thanet for all pollutants. It was therefore deemed unnecessary to declare an Air Quality Management Area (AQMA) in Thanet at that time.

## 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. Thanet District Council completed this in May 2003, with the conclusion that all air quality objectives were expected to be met. Defra accepted the USA conclusions. The Annual Progress Report (APR) for 2004 considered air quality monitoring results for 2003, which showed increased levels due to the prevailing stable meteorological conditions. The APR concluded that seven busy junctions warranted further assessment for $NO_2$ and five of these also warranted further assessment of $PM_{10}$. Potential exceedences of the Objectives were indicated at:

- The Square, Birchington $NO_2/PM_{10}$
- King Street/Boundary Road/Hereson Road, Ramsgate $NO_2/PM_{10}$
- Marine Gardens, Margate $NO_2/PM_{10}$
- The Broadway, Broadstairs $NO_2$
- College Road, Margate $NO_2/PM_{10}$
- Queens Avenue/Ramsgate Road, Margate $NO_2/PM_{10}$
- Haine Road, Ramsgate $NO_2$

## 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 and analysis of further monitoring results. 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. 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 of road traffic sources has been undertaken using the ADMS-Roads dispersion model using the vehicle emission factors released by Defra in 2002. Nitrogen dioxide continuous and diffusion tube monitoring carried out within the assessment area has been used to verify and subsequently adjust the modelled results accordingly.

The bias adjustment factor for diffusion tubes has been estimated through a co-location study with the continuous analyser at Kentmere Avenue, as described in later sections of this report along with full details of model verification procedures.

Pollutant concentrations based on road traffic emissions have been predicted for the current year, assumed to be 2003 (the last complete year for monitoring), and future years 2005 and 2010 for nitrogen dioxide, and 2004 and 2010 for fine particulates ($PM_{10}$) in line with the relevant UK Air Ouality objectives and EU Air Quality Limit Values (Table 1.1).

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

## Table 1.1 Summary of Air Quality Objectives Assessed Within the Detailed Assessment

| Pollutant | Air Quality Objective | | Date to be achieved by |
|---|---|---|---|
| | Concentration | Measured as | |
| Nitrogen dioxide [a] | 200 μg/m$^3$ not to be exceeded more than 18 times a year | 1 hour mean | 31.12.2005 [b] |
| | 40 μg/m$^3$ | annual mean | 31.12.2005 [b] |
| Particles ($PM_{10}$) (gravimetric)[c] (All authorities) | 50 μg/m$^3$ not to be exceeded more than 35 times a year | 24 hour mean | 31.12.2004 |
| | 40 μg/m$^3$ | annual mean | 31.12.2004 |
| Particles ($PM_{10}$) (gravimetric)[b] – Not set in Regulations to date | 50 μg/m$^3$ not to be exceeded more than 7 times a year | 24 hour mean | 31.12.2010 |
| | 20 μg/m$^3$ | annual mean | 31.12.2010 |

*a* The objectives for nitrogen dioxide are provisional.
*b* The EU Air Quality Standards (99/30) target date is 01/01/2010.
*c* Measured using the European gravimetric transfer sampler or equivalent

# 2 BASELINE INFORMATION

## 2.1 Traffic Data

Kent Count Council, through their consultants Jacobs Babtie, provided traffic flows and turning count information from which the annual average daily traffic flows (AADT) as used in this assessment have been derived.

Forecast factors for future years were derived using TEMPRO/NAEI central growth figures. These suggest that traffic growth in Thanet is estimated to be 1.028% between 2003 and 2005, and 1.102% between 2003 and 2010.

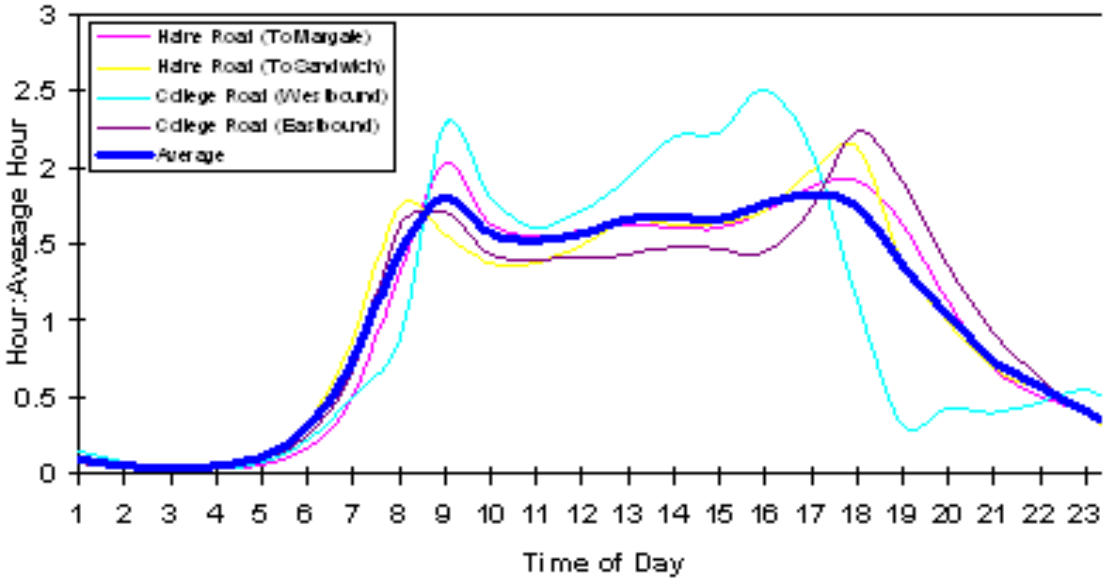
In the absence of speed data, with the exception of the Square, Birchington, speeds have been based on speed limits, modified according to local conditions to take account of congestion and stop/start vehicle movements at junctions. Speeds were reduced at junctions to 20kph within 25m of junctions in accordance with LAQM.TG (03) to reflect the higher emissions of queuing traffic.

The data used in this assessment, with the forecast vehicle flows for 2005 and 2010, are shown in Appendix 1.

The diurnal profiles for Thanet as derived from automatic traffic count (ATC) data are shown in figure 2.1 below.

The diurnal pattern information indicates that very similar patterns are experienced at the three different locations in Thanet and the average pattern was applied to the AADT. The diurnal pattern show clear AM and PM peaks in traffic, with much lower flows between the hours of 11pm and 7am.

**Figure 2.1 Diurnal Traffic Profiles**




## 2.2 Local Monitoring Data

Thanet District Council has three continuous air quality monitoring sites within the District. One at an urban background site at Salmestone School, Margate (grid reference x=635459, y=169836), the second at a roadside site on Boundary Road, Margate (grid reference x=635487, y=165433), and the third at a suburban location at Kentmere Avenue, Ramsgate (grid reference x=635931, y=165331). Diffusion tubes have been co-located at the Kentmere site in 2003 and these have been used to determine the bias adjustment factor for the diffusion tubes.

A summary of the continuous monitoring results is provided in Table 2.1 below.

**Table 2.1 Summary of Continuous Monitoring in Thanet 2003**

| Monitoring Location | Salmestone School | Boundary Road | Kentmere Avenue |
|---|---|---|---|
| $NO_2$ annual mean in $\mu g/m^3$ | 26.0 | 34.8 | 22.8 |
| % Data Capture | 98.9 | 81.9 | 77.3 |
| $PM_{10}$ annual mean in $\mu g/m^3$ | - | 42.9 | - |
| Data Capture % | - | 76% | - |
| Number of 24-Hour Mean $PM_{10} > 50$ | - | 73 | - |

The annual mean $PM_{10}$ at Boundary Road was 42.9$\mu g/m^3$ i.e. above the current objective levels for 2004. Current monitoring indicates that the 24-hour mean objective is also not being met at the roadside site on Boundary Road. However, it should be noted that it is very likely that the measured levels are higher than actual $PM_{10}$ levels at this site as a) 2003 was generally a high pollution year for $PM_{10}$ and pollution episodes leading to exceedences of the 24-hour Objective were more frequent than in recent years b) The method of monitoring is a BAM, which have a tendency to over read c) as the main source of emissions is road traffic and the $NO_2$ Objective is met at this site, it is unlikely that $PM_{10}$ levels would actually be this high based on nearby traffic emissions (Experience from LAQM show that for road traffic sources, the $PM_{10}$ AQMA boundary generally sits within the $NO_2$ AQMA, unless other non-road sources are contributing to $PM_{10}$ locally).

In addition to the continuous air quality monitoring sites, Thanet District Council also currently operate 23 $NO_2$ diffusion tubes sites. Diffusion tubes used by Thanet District Council are supplied by Harwell Scientifics and analysed by Kent Scientific Services utilising the 50% Triethanolamine (TEA) in acetone preparation method. Kent Scientific Services are currently UKAS accredited for this method.

The continuous analyser nitrogen dioxide data at Kentmere Avenue has been used with the co-located diffusion tube data to estimate the local bias adjustment factor for the diffusion tubes. Bias adjustment factors for 2003 of 0.97 has been derived locally. The bias adjustment figure from the Updating and Screening Assessment of 0.836 has been applied to the 2002 diffusion tube data. The corrected $NO_2$ diffusion tube monitoring results for 2002 and 2003, with projection to 2005 and 2010 for roadside and kerbside sites, are shown in Table 2.3 below.

Diffusion tube monitoring indicates that a number of exceedences are monitored within the District. It should be noted that the exceedences are limited to kerbside monitoring sites which represent the worse case concentrations where the annual mean Objective does not generally apply. However, placement of diffusion tubes is not often possible on building facades, as there are no external drainpipes or other furniture commonly used for placement. A comparison of 2002 monitoring data with data for 2002 indicate that the 2003 results are significantly higher, with levels of >10$\mu g/m^3$ at a number of locations.

Monitoring data for 2003 at the diffusion tube roadside/kerbside sites within the assessment areas have been collated and assessed for model verification purposes. A comparison of monitored and modelled predictions for $NO_X/NO_2$ is shown in Appendix 2 with a full description of the verification methodology.

**Table 2.3 Diffusion tube results 2002 -2003 in μg/m$^3$; with projection to 2005 and 2010(bias corrected)**

| Tube ID | Grid reference | Location | Site Type * | Annual mean $NO_2$ 2002 | Annual mean $NO_2$ 2003 | 2003 Annual mean $NO_2$ (2005) (projected) | 2003 Annual mean $NO_2$ (2010) (projected) |
|---|---|---|---|---|---|---|---|
| TH04 | TR 393 659 | St James Avenue, Ramsgate | B | 20.0 | 27.6 | - | - |
| TH05 | TR 390 680 | The Broadway, Broadstairs | K | 33.6 | 45.1 | **42.8** | 35.2 |
| TH10 | TR 355 698 | College Road, Margate | K | 34.3 | 41.5 | 39.3 | 32.3 |
| TH13 | TR 302 690 | The Square, Birchington | K | - | 51.4 | **48.7** | **40.1** |
| TH16 | TR 344 643 | Earlesmede Crescent, Cliffsend | B | 15.7 | 23.5 | - | - |
| TH23 | TR 354 708 | Cecil Square, Margate | K | 32.3 | 48.6 | **46.1** | 37.9 |
| TH26 | TR 385 655 | King Street, Ramsgate | K | 35.6 | 46.6 | **44.2** | 36.3 |
| TH27 | TR 370 663 | Avebury Avenue, Ramsgate | B | 17.1 | 25.0 | - | - |
| TH29 | TR 361 655 | Derwent Avenue, Ramsgate | K | 19.0 | - | - | - |
| TH30 | TR 374 645 | Marine Gardens, Margate | K | 33.8 | 46.4 | **44.0** | 36.2 |
| TH31 | TR 346 660 | High Street, Manston | B | 15.8 | - | - | - |
| TH32 | TR 329 664 | Bell Davies Drive, Manston | B | 17.0 | - | - | - |
| TH33 | TR 311 654 | Hill House Drive, Minster | B | 16.6 | - | - | - |
| TH34 | TR 365 678 | Westwood Road Broadstairs | K | 22.2 | - | - | - |
| TH35 | TR 364 678 | Margate Road, Ramsgate | K | 34.2 | 44.4 | **42.1** | 34.7 |
| TH36 | TR 364 682 | Ramsgate Road, Margate (Star Lane) | K | 30.8 | 39.9 | 37.8 | 31.1 |
| TH37 | TR 359 654 | Kentmere Avenue, Ramsgate | S | - | 26.9 | - | - |
| TH38 | TR 359 654 | Kentmere Avenue, Ramsgate | S | - | 23.7 | - | - |
| TH39 | TR 358 694 | Ramsgate Road, Margate (QEQM) | K | - | 32.8 | 31.1 | 25.6 |
| TH40 | TR 358 664 | Haine Road, Ramsgate | K | - | 41.0 | 38.9 | 32.0 |
| TH41 | TR 314 695 | Canterbury Road West | K | - | 32.4 | 30.7 | 25.3 |
| TH42 | TR 344 651 | Canterbury Road East | K | - | 34.8 | 33.0 | 27.1 |
| TH43 | TR 380 680 | Broadstairs Road, Broadstairs | K | - | 35.7 | 33.8 | 27.8 |

*K=Kerbside site, B=background site, S=suburban site

## 2.3 Background Concentrations

For the $NO_2$ and $NO_X$ assessments, background concentrations have been derived from local background monitoring. Average $PM_{10}$ background concentrations have been derived from NETCEN modelled concentration maps for receptors within the assessment areas (x=339500, y=730500). 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 2.4.

**Table 2.4 Background Concentrations in µg/m³**

| Year | Background $NO_X$ | Background $NO_2$ | Background $PM_{10}$ |
|---|---|---|---|
| 2003 | 39.0 | 24.0 | 18.5 |
| 2004 | - | - | 18.2 |
| 2005 | 36.6 | 23.0 | - |
| 2010 | 29.3 | 19.7 | 16.8 |

## 2.4 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 from Manston meteorological station (2003) has therefore been used within the ADMS-Roads model. The wind rose for the Manston meteorological data and is shown in Figure 2.2. The Manston windrose highlight a dominant south westerly wind direction, and also a significant easterly.

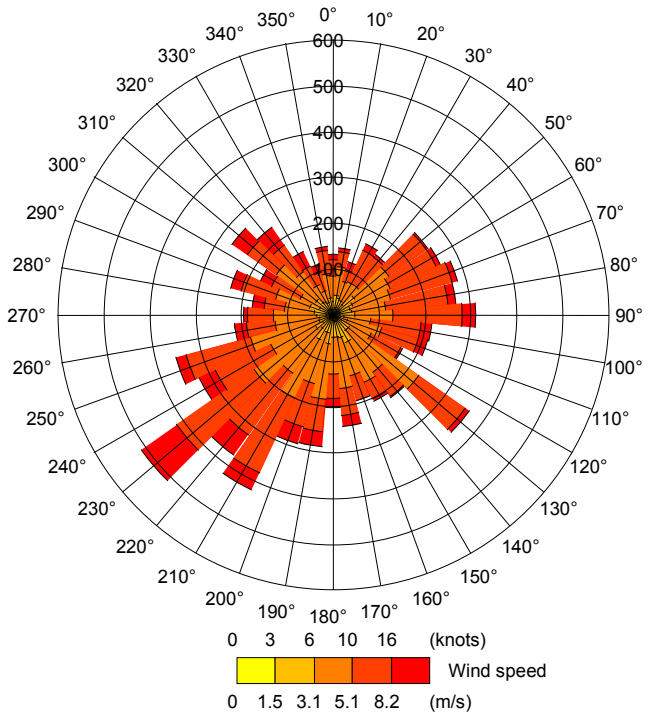
ADMS-Roads is the latest model in the ADMS family from Cambridge Environmental Research Consultants. Based on the ADMS-Urban system, it can model up to 150 road sources and 7 industrial sources at any one time. The model has been extensively used in local air quality management, and has formed the basis for many AQMA declarations. ADMS-Roads has integrated modules to take into account the effects of street canyons and plume chemistry. The predictions from dispersion models for road traffic should be compared against local monitoring data in order to locally verify the model. This is described further in section 2.5.

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 based on the new DfT emission factors as described within the National Atmospheric Emissions Inventory (NAEI) and used with the DMRB screening tool.

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 has been 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.

**Figure 2.2 Windrose for Manston Meteorological Data 2003**



## 2.5 Model Verification and Adjustment

### 2.5.1 NOx/$NO_2$

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 of $NO_X$ and conversion to $NO_2$ has been carried out using the $NO_X$: $NO_2$ ratio using the conversion method in LAQM.TG (03).

Verification has been undertaken using 2003 data from six kerbside diffusion tube sites in the assessment areas, which are representative of the junctions being assessed. As part of the local verification, an adjustment factor for the predicted road traffic related NOx is derived when compared to local monitoring. The $NO_X$ roads contribution factor used in this Detailed Assessment to correct modelled results is 6.5. The full verification process is shown in Appendix 2.

During the verification process Casella Stanger aim to show that all final modelled $NO_2$ concentrations are within 10% of the monitored $NO_2$ concentrations, as shown in Table 2.5. Modelled results may not compare as well at some locations for a number of reasons including:

- Errors in traffic flow data estimates
- Model setup (including street canyons, road widths, receptor locations)
- Model limitations (treatment of roughness and meteorological data)
- Uncertainty in monitoring data

**Table 2.5 Comparison of Modelled and Monitored $NO_2$ Results at Diffusion Tube Sites**

| Site ID | Diffusion Tube Location | Monitored $NO_2$ (2003) in $\mu g/m^3$ | Modelled $NO_2$ (2003) in $\mu g/m^3$ | % Difference |
|---|---|---|---|---|
| TH30 | Marine Gardens, Margate | 46.4 | 42.6 | -8.3 |
| TH05 | Broadway, Broadstairs | 45.1 | 42.5 | -5.8 |
| TH10 | College Road, Margate | 41.5 | 43.6 | 5.0 |
| TH40 | Haine Road, Ramsgate | 41 | 43.1 | 5.2 |
| TH13 | The Square, Birchington | 51.4 | 55.2 | 7.4 |
| TH36 | Ramsgate Road, Margate | 39.9 | 40.0 | 0.3 |

Within the King Street/Boundary Road assessment area, there is a roadside continuous analyser and diffusion tube site. The modelled results at these locations, showed much better agreement with the continuous analyser than the diffusion tube for 2003 but the average $NO_X$ roads verification factor at this site (x11.7) is higher than within the other assessment

areas. This may be due to the fact that 2003 monitoring results are overestimated at this location as 2003 results were much higher (>10μg/m$^3$) than 2002. Verification has therefore been based on the six sites as shown in Table 2.5 and Appendix 2. The verified modelled results show better agreement with the 2002 diffusion tube results than 2003, as shown in table 2.6, and show good agreement with the continuous analyser.

**Table 2.6 Comparison of Modelled and Monitored $NO_2$ Results at King Street/Boundary Road**

| Site ID | Diffusion Tube Location | Projected Monitored $NO_2$ 2005 (based on 2002) in μg/m$^3$ | Projected Monitored $NO_2$ 2005 (based on 2003) in μg/m$^3$ | Modelled $NO_2$ (2005) in μg/m$^3$ |
|---|---|---|---|---|
| TH26 | Kings Road, Ramsgate diffusion tube | 32.8 | 44.2 | 34.8 |
| ZH4 | Boundary Road, Ramsgate continuous analyser | - | 33.0 | 33.4 |

### 2.5.2 $PM_{10}$

Dispersion modelling of $PM_{10}$ is difficult due to the number of different components of $PM_{10}$, and has been the subject of some review within the recent draft AQEG report. This has indicated that there is a 5-7 fold difference in model performance for open motorways compared to more urban roads, and in most cases dispersion models under-predict significantly in urban settings.

There are a number of potential reasons why models may under-predict $PM_{10}$ concentrations from road traffic sources, including internal model parameters (such as surface roughness, street canyons, source height).

In addition, there may be considerable uncertainty in the following information:

- Traffic emissions of $PM_{10}$;
- Background $PM_{10}$ (secondary and course fractions);
- Re-suspended roadside component;

For the dispersion modelling of $PM_{10}$ undertaken in this assessment, the maximum predicted annual average road traffic contribution of $PM_{10}$ was 1.7 μg/m$^3$ at the nearest receptor to The Square in Birchington (where maximum $NO_2$ concentrations are predicted).

The roadside $PM_{10}$ monitoring site at Boundary Road, Ramsgate is within an area undergoing detailed assessment and as such was considered for model verification purposes. The roadside monitoring is based on BAM (β – attenuation) measurements and a comparison of the modelled versus monitored showed that the model does not correspond well with the measured results at this location. The recent draft AQEG report indicates that BAM measurements may be about 20% greater than TEOM (corrected for gravimetric) measurements for annual means, and potentially greater for number of exceedences. This is consistent with roadside sites in Kent as TEOM show much lower levels than the BAM analysers (even at the busiest roadsides) and only the BAM analysers measure concentrations above the Objective level.

In reality it would be expected that the contribution from road traffic to $PM_{10}$ concentrations would be greater than has been modelled, although not to the extent indicated through the BAM measurements. At this particular roadside site, the BAM measurement indicate that $PM_{10}$ objectives are exceeded, while the annual mean $NO_2$ Objective is met (34.9µg/m$^3$ in 2003). This is highly unusual where roadside emissions are the main source and there are no other roadside sites in Kent where this occurs (The $NO_2$:$PM_{10}$ relationship at nine roadside sites are shown in Figure 2.3 and 2.4 and indicates that the Thanet Roadside is exceptional). The only roadside sites in Kent exceeding the $PM_{10}$ Objectives are those sites based on BAM measurements in north Kent (Dartford and Gravesham Boroughs) where background levels are much higher than Thanet and $NO_2$ annual mean exceedences are also predicted. The Thanet roadside BAM readings indicate that either other $PM_{10}$ sources are present in the vicinity above the roadside contribution or the BAM is over reading significantly. As such, it is considered that the Boundary Road BAM is over predicting $PM_{10}$ levels and is unsuitable for model verification purposes.

The draft AQEG report indicates that the annual average $PM_{10}$ objective for 2004 is likely to be met at most locations, including roadside, in the UK but that the 24-hour objective may not be achieved near major roads, notably in London. Where prevailing meteorological conditions may lead to high background levels due to transport of particles from mainline Europe more areas may exceed the 24-hour objective.

Modelling of future annual average $PM_{10}$ concentrations is perhaps subject to more uncertainty as background concentrations, and high years due to transboundary effects, are likely to vary. Indications are that the annual average $PM_{10}$ 2010 limit value will be exceeded at many urban and roadside sites. Estimates of the number of exceedences of the proposed 24-hour limit value vary considerably and will also be subject to variations due to background concentrations and prevailing meteorological conditions.

For the purposes of this assessment, predicted annual mean $PM_{10}$ concentrations have not been provided in the assessment areas where the $NO_2$ annual mean is clearly met as it is unlikely that $PM_{10}$ exceedences will occur at these roadside sites. The LAQM review and assessment process has shown $PM_{10}$ AQMA to sit within the $NO_2$ AQMA where the main source of emissions is road transport. Annual $PM_{10}$ concentrations have been assessed where the $NO_2$ annual mean Objective is predicted to be exceeded (i.e. The Square, Birchington assessment area) using the relationship shown in figure 2.4 for the Kent roadside sites and subsequently applying the TG(03) methodology for estimating the number of exceedences of the 24-hour mean:

$$No.\ exceedences = -18.5 + 0.00145 \times (PM_{10}\ annual\ mean)^3 + 206 / PM_{10}\ annual\ mean$$

**Figure 2.3 $NO_2$:$PM_{10}$ annual mean relationship at Kent roadside sites (2003) - including Thanet Roadside (ZH4)**

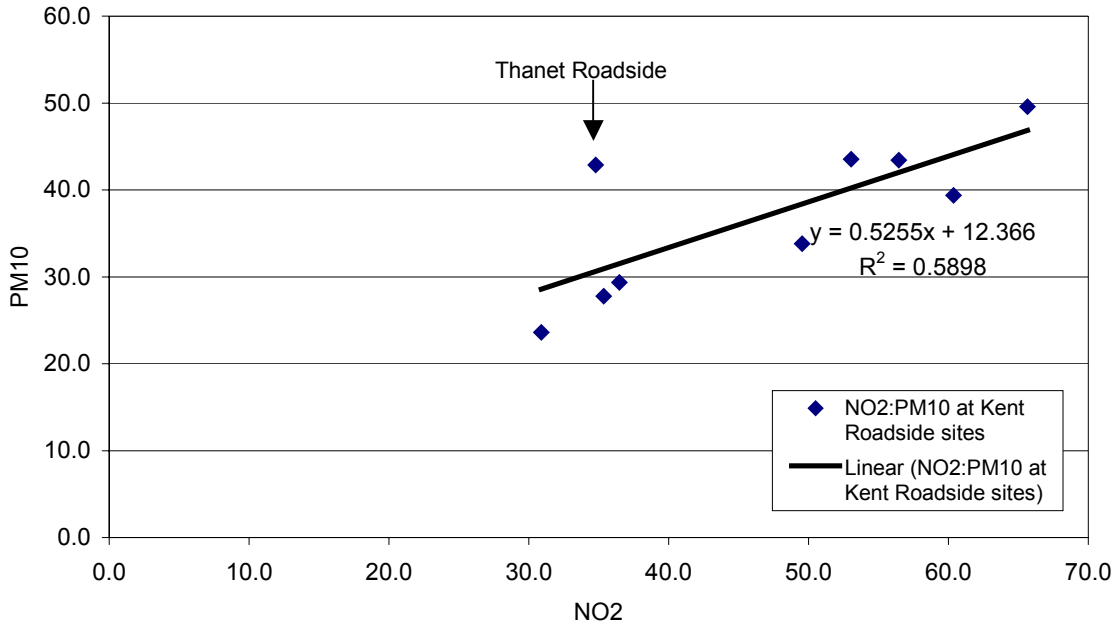
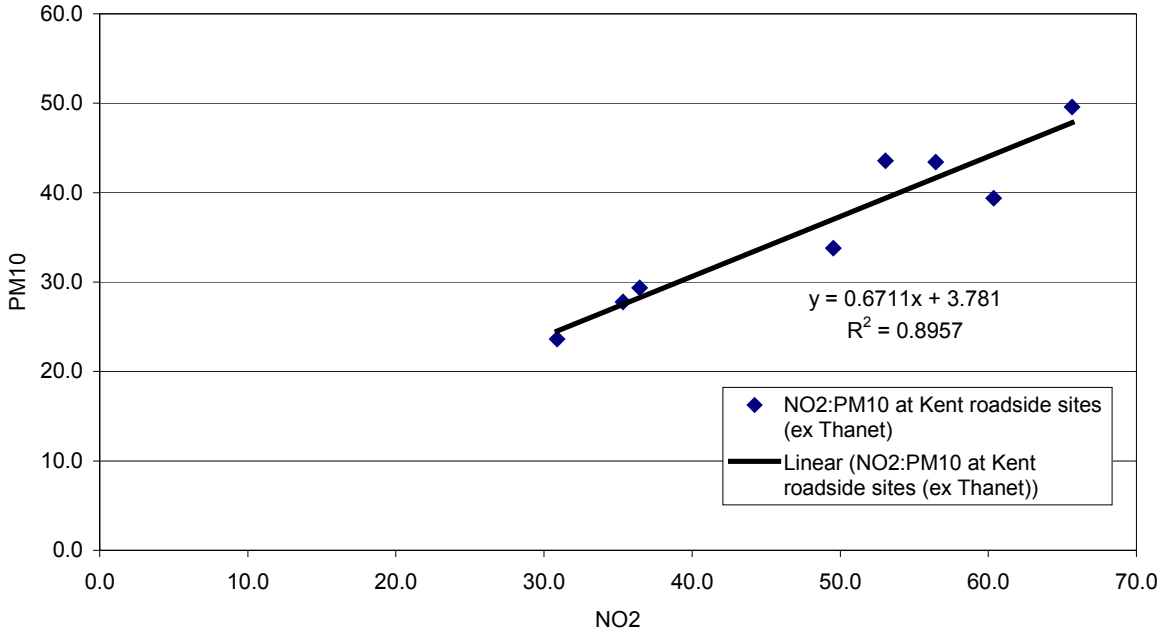



**Figure 2.4 $NO_2$:$PM_{10}$ annual mean relationship at Kent roadside sites (2003) - excluding Thanet Roadside (ZH4)**


60.0
50.0
40.0
30.0
20.0
10.0
0.0
PM10
0.0
10.0
20.0
30.0
40.0
50.0
60.0
70.0
NO2
y = 0.6711x + 3.781
R2 = 0.8957
NO2:PM10 at Kent roadside sites (ex Thanet)
Linear (NO2:PM10 at Kent roadside sites (ex Thanet))

# 3 RESULTS

Annual average concentrations for $NO_2$ and $PM_{10}$ were predicted for the baseline year 2003 and future years 2004 and 2010 (for $PM_{10}$) and 2005 and 2010 (for $NO_2$) at specific receptor locations in each area undergoing Detailed Assessment (NB $PM_{10}$ has been assessed where $NO_2$ exceedences were predicted), in addition to a 5m-grid spacing across the assessment areas for the production of contour maps where exceedences of the Objectives were predicted. The results are shown in Appendix 3 of this report.

All predicted results have been produced using the verification methodology described in Section 2.5 of this report. For predictions for future years, the same verification methodology has been applied, but relevant projected background concentrations have been applied.

The dispersion modeling has been undertaken for seven areas to include all the identified potential exceedence areas:

## 3.1 The Square, Birchington Assessment Area

### 3.1.1 $NO_X/NO_2$ Concentrations

The verified modelled $NO_2$ annual mean concentrations in 2005 at specific receptors, indicate predicted exceedences of the 2005 Objective. The maximum predicted concentration in 2005 is 52.7μg/m$^3$ to the north of the junction (x=630243, y=169085). Figures 5.2 – 5.3, show the $NO_2$ annual mean contours.

The verified modelled $NO_2$ annual mean concentrations in 2010 indicate that the EU Limit is not likely to be met at all receptor locations. With a maximum annual mean prediction of 47.6μg/m$^3$ (x=630243, y=169085).

The elevated levels above those monitored to the south of the junction are likely to be due to the prevailing wind direction of the meteorological data within the model.

### 3.1.2 $PM_{10}$ Concentrations

The maximum predicted annual mean $PM_{10}$ concentrations and number of exceedences of the 24-hour mean $PM_{10}$ Objective have been predicted using the maximum predicted $NO_2$ annual mean concentration in 2004 and the methodology described in section 2.5.2 above. The maximum predicted $NO_2$ of 54.1μg/m$^3$ in 2004, equates to a 40.1μg/m$^3$ $PM_{10}$ annual mean and 80 exceedences of the $PM_{10}$ 24 hour mean Objective (35 exceedences permitted). There is therefore a risk of exceedence of the $PM_{10}$ Objectives within this assessment area. The exceedence area for $PM_{10}$ will sit within the modelled 40μg/m$^3$ $NO_2$ exceedence area, as, using the methodology described in section 2.5.2 above, more than 42μg/m$^3$ $NO_2$ annual mean $NO_2$ would be required to equate to greater than 35 exceedences of the $PM_{10}$ 24 hour mean Objective.

It should be noted that as the predictions are based on 2003 model verification, the predictions are likely to be conservative.

## 3.2 King Street/Boundary Road Assessment Area

### 3.2.1 $NO_X/NO_2$ Concentrations

The verified modelled $NO_2$ annual mean concentration in 2005 at the specific receptors modelled in the King Street/Boundary Road assessment area, as shown in Figure 5.5,

indicates the Objective is likely to be met at all receptor locations. The maximum predicted concentration in 2005 is 36.4μg/m$^{3.}$ at the junction of King Street/Boundary Road (x=638529, y=165424) i.e. below the 40μg/m$^3$ Objective level.

### 3.3 Marine Gardens, Margate Assessment Area

#### 3.3.1 $NO_X/NO_2$ Concentrations

The verified modelled $NO_2$ annual mean concentration in 2005 at the specific receptors modelled in the Marine Gardens, Margate assessment area, as shown in Figure 5.7, indicates the Objective is likely to be met at all receptor locations. The maximum predicted concentration in 2005 is 36.4μg/m$^{3.}$ at the junction of Marine Gardens and Belgrave Road (x=635214, y=170735) i.e. below the 40μg/m$^3$ Objective level.

The kerbside diffusion tube at Marine Gardens indicates exceedences of the Objective in 2005 at the kerbside, however it is expected that at the façade of receptors the Objective will be met. In 2002 (and similarly in 2004) the monitoring results are much lower (>10μg/m$^3$) and are already below the Objective level.

### 3.4 The Broadway, Broadstairs

#### 3.4.1 $NO_X/NO_2$ Concentrations

The verified modelled $NO_2$ annual mean concentration in 2005 at the specific receptors modelled in the Broadway, Broadstairs assessment area, as shown in Figure 5.9, indicates the Objective is likely to be met at all receptor locations. The maximum predicted concentration in 2005 is 33.3μg/m$^{3.}$ at the junction of St Peters Road/Osbourne road (x=639035, y=167954) i.e. below the 40μg/m$^3$ Objective level.

The kerbside diffusion tube TH05 within this assessment area is predicted to exceed the Objective in 2005, based on 2003 monitoring results. However, there is no relevant exposure at this location and the nearest receptors to the St Peters Road/Osbourne road junction are at first floor locations. It is not expected that there will be exceedences at relevant receptor locations.

### 3.5 College Road, Margate

#### 3.5.1 $NO_X/NO_2$ Concentrations

The verified modelled $NO_2$ annual mean concentration in 2005 at the specific receptors modelled in the College Road, Margate assessment area, as shown in Figure 5.11, indicates the Objective is likely to be met at all receptor locations. The maximum predicted concentration in 2005 is 38.0μg/m$^{3.}$ at the junction of Ramsgate Road/College Road (x=635566, y=169836) i.e. below the 40μg/m$^3$ Objective level.

### 3.6 Ramsgate Road/Queens Avenue, Margate

#### 3.6.1 $NO_2$ Concentrations

The verified modelled $NO_2$ annual mean concentration in 2005 at the specific receptors modelled in the Ramsgate Road, Margate assessment area, as shown in Figure 5.13, indicates the Objective is likely to be met at all receptor locations. The maximum predicted

concentration in 2005 is 31.8μg/m$^{3.}$ at the junction of Ramsgate Road/Star Lane (x=636412, y=168209) i.e. below the 40μg/m$^3$ Objective level.

## 3.7 Haine Road, Ramsgate

### 3.7.1 $NO_2$ Concentrations

The verified modelled $NO_2$ annual mean concentration in 2005 at the specific receptors modelled in the Haine Road, Ramsgate assessment area, as shown in Figure 5.15, indicates the Objective is likely to be met at all receptor locations. The maximum predicted concentration in 2005 is 32.6μg/m$^{3.}$ at the junction of Haine Road/Spratling Street (x=635851, y=166485) i.e. below the 40μg/m$^3$ Objective level.

The kerbside monitoring tube in 2003, showed projected levels in 2005below the $NO_2$ annual mean Objective (but above 36μg/m$^3$). As the relevant receptor locations are >10m from the kerbside, it is expected that the Objective will be met.

# 4 CONCLUSIONS AND RECOMMENDATIONS

The verified modelled annual mean $NO_2$ results for road traffic emissions in 2005 in The Square, Birchington assessment area indicate annual mean nitrogen dioxide concentrations at relevant receptor locations will exceed the annual mean Objective of 40μg/m$^3$. There are also predicted $PM_{10}$ concentrations above the Objective levels within this assessment area. It is therefore recommended that Thanet District Council consider declaration of AQMA for $NO_2$ and $PM_{10}$ in this area.

The verified modelled annual mean $NO_2$ results in 2005 in the: Marine Gardens, Margate assessment area, The Broadway, Broadstairs assessment area, College Road, Margate assessment area, Kings Street/Boundary Road assessment area, Ramsgate Road/ Queens Avenue, Margate assessment area and Haine Road, Ramsgate assessment area, predicted that the Objectives would be met and no AQMAs are required in these areas.

To take account of uncertainty in the model, the Technical Guidance LAQM.TG(03) suggests that predicted concentrations above 36μg/m$^3$ may exceed the annual mean Objective (10% of the annual mean Objective)) and the Council may wish to consider using the 36μg/m$^3$ concentration as the outer extent of the AQMA. Whilst systematic under or over-predictions can be taken into account through the model verification process, random errors will occur and uncertainty will exist in corrected data.

In order to facilitate the declaration of an AQMA, separate contour lines have been drawn representing the Objective and model uncertainty levels for $NO_2$ where exceedences have been predicted. 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).

# 6 REPORT STATEMENT

This Report was completed by Casella Stanger on the basis of a defined programme of work and terms and conditions agreed with the Client. We confirm that in preparing this Report we have exercised all reasonable skill and care taking into account the project objectives, the agreed scope of works, prevailing site conditions and the degree of manpower and resources allocated to the project.

Casella Stanger accept no responsibility to any parties whatsoever, following the issue of the Report, for any matters arising outside the agreed scope of the works.

This Report is issued in confidence to the Client and Casella Stanger have no responsibility to any third parties to whom this Report may be circulated, in part or in full, and any such parties rely on the contents of the report solely at their own risk.

Unless specifically assigned or transferred within the terms of the agreement, the consultant asserts and retains all Copyright, and other Intellectual Property Rights, in and over the Report and its contents.

Any questions or matters arising from this Report should be addressed in the first instance to the Project Manager.