



2009 Air Quality Updating and Screening Assessment for *Ipswich Borough Council*

In fulfillment of Part IV of the Environment Act 1995
Local Air Quality Management

December 2009

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Executive Summary

Diffusion tubes located within the three existing AQMAs have shown exceedences in nitrogen dioxide. Exceedences were also obtained at St-Matthew's Street and St-Helen's Street which are outside the existing AQMAs. These two locations have been monitored since November 2007 and further monitoring is recommended owing to the close proximity of the residential properties to the monitoring sites. Modelling of the St-Matthew's Street/Berners Road/Civic Drive junction predicted exceedences in nitrogen dioxide at the three modelled receptor points.

A Detailed Assessment for nitrogen dioxide is required at St-Matthew's Street and St-Helen's Street with a view to determining whether or not to declare an AQMA. The monitoring location showing the exceedance on St Helens Street is located in between the St-Margaret's AQMA and the Star Lane Gyratory AQMA. The findings of the Detailed Assessment should determine whether the two AQMA boundaries should be merged, thereby increasing its area. A new AQMA order may then be necessary.

Ipswich Borough Council has assessed a 2.90MW biomass combustion plant on Nacton Road and concluded that it will be necessary to proceed to a Detailed Assessment for particulate matter with consideration given to nitrogen dioxide. Particulate matter and nitrogen dioxide emissions from the Reg Driver Centre, Christchurch Park, Ipswich will also require further screening work.

Further investigation into dust complaints around the Port Area of Ipswich are ongoing and will be reported on within further submissions.

The next course of action for Ipswich Borough Council is to submit the 2010 Progress Report and progress to 2010 Detailed Assessment for the pollutants and sites mentioned above.

Table of contents

1	Introduction	4
1.1	Description of Local Authority Area	4
1.2	Purpose of Report	4
1.3	Air Quality Objectives	4
1.4	Summary of Previous Review and Assessments	6
2	New Monitoring Data	9
2.1	Summary of Monitoring Undertaken	9
2.2	Comparison of Monitoring Results with AQ Objectives	16
3	Road Traffic Sources	22
3.1	Narrow Congested Streets with Residential Properties Close to the Kerb	22
3.2	Busy Streets Where People May Spend 1-hour or More Close to Traffic	22
3.3	Roads with a High Flow of Buses and/or HGVs.	22
3.4	Junctions	22
3.5	New Roads Constructed or Proposed Since the Last Round of Review and Assessment	23
3.6	Roads with Significantly Changed Traffic Flows	23
3.7	Bus and Coach Stations	24
4	Other Transport Sources	25
4.1	Railways (Diesel and Steam Trains)	25
4.2	Ports (Shipping)	25
5	Industrial Sources	26
5.1	Industrial Installations	26
5.2	Major Fuel (Petrol) Storage Depots	27
5.3	Petrol Stations	27
5.4	Poultry Farms	27
6	Commercial and Domestic Sources	29
6.1	Biomass Combustion – Individual Installations	29
6.2	Biomass Combustion – Combined Impacts	30
6.3	Domestic Solid-Fuel Burning	30
7	Fugitive or Uncontrolled Sources	31
8	Conclusions and Proposed Actions	32
8.1	Conclusions from New Monitoring Data	32
8.2	Conclusions from Assessment of Sources	32
8.3	Proposed Actions	32
9	References	34

Ipswich Borough Council - England

Appendices

Appendix A	Location of Air Quality Management Areas
Appendix B	Location of monitoring sites in Ipswich showing the annual trend in NO ₂ levels from 2005-2008
Appendix C	QA:QC Data
Appendix D	DMRB Calculations

1 Introduction

1.1 Description of Local Authority Area

Ipswich is the county town of Suffolk and the fastest growing regional centre in the East of England.

It is a multi-cultural centre for business, culture, entertainment and sport, with a population of more than 130,000 and is home to University Campus Suffolk and Suffolk New College.

The main routes into and out of Ipswich are congested during typical rush hour times. Travel across Ipswich is restricted to certain routes by the River Orwell.

Transport and traffic management are key strategic priorities for the town as the Waterfront area and other areas of the town are undergoing significant redevelopment.

Continuing this economic prosperity is dependent on people being able to move around the town for work, shopping and leisure. At present a significant number of these journeys are made by car.

1.2 Purpose of Report

This report fulfils the requirements of the Local Air Quality Management process as set out in Part IV of the Environment Act (1995), the Air Quality Strategy for England, Scotland, Wales and Northern Ireland 2007 and the relevant Policy and Technical Guidance documents. The LAQM process places an obligation on all local authorities to regularly review and assess air quality in their areas, and to determine whether or not the air quality objectives are likely to be achieved. Where exceedences are considered likely, the local authority must then declare an Air Quality Management Area (AQMA) and prepare an Air Quality Action Plan (AQAP) setting out the measures it intends to put in place in pursuit of the objectives.

1.3 Air Quality Objectives

The air quality objectives applicable to LAQM in England are set out in the Air Quality (England) Regulations 2000 (SI 928), The Air Quality (England) (Amendment) Regulations 2002 (SI 3043), and are shown in Table 1.1. This table shows the objectives in units of microgrammes per cubic metre $\mu\text{g}/\text{m}^3$ (milligrammes per cubic metre, mg/m^3 for carbon monoxide) with the number of exceedences in each year that are permitted (where applicable).

Table 1.1 Air Quality Objectives included in Regulations for the purpose of Local Air Quality Management in England.

Pollutant	Air Quality Objective		Date to be achieved by
	Concentration	Measured as	
Benzene	16.25 $\mu\text{g}/\text{m}^3$	Running annual mean	31.12.2003
	5.00 $\mu\text{g}/\text{m}^3$	Annual mean	31.12.2010
1,3-Butadiene	2.25 $\mu\text{g}/\text{m}^3$	Running annual mean	31.12.2003
Carbon monoxide	10.0 mg/m^3	Running 8-hour mean	31.12.2003
Lead	0.5 $\mu\text{g}/\text{m}^3$	Annual mean	31.12.2004
	0.25 $\mu\text{g}/\text{m}^3$	Annual mean	31.12.2008
Nitrogen dioxide (NO₂)	200 $\mu\text{g}/\text{m}^3$ not to be exceeded more than 18 times a year	1-hour mean	31.12.2005
	40 $\mu\text{g}/\text{m}^3$	Annual mean	31.12.2005
Particles (PM₁₀) (gravimetric)	50 $\mu\text{g}/\text{m}^3$, not to be exceeded more than 35 times a year	24-hour mean	31.12.2004
	40 $\mu\text{g}/\text{m}^3$	Annual mean	31.12.2004
Sulphur dioxide	350 $\mu\text{g}/\text{m}^3$, not to be exceeded more than 24 times a year	1-hour mean	31.12.2004
	125 $\mu\text{g}/\text{m}^3$, not to be exceeded more than 3 times a year	24-hour mean	31.12.2004
	266 $\mu\text{g}/\text{m}^3$, not to be exceeded more than 35 times a year	15-minute mean	31.12.2005

1.4 Summary of Previous Review and Assessments

Round 1

The first round of air quality review and assessment was completed in March 2001 and consisted of three stages, each reported separately and progressively looking into more detailed analysis when required;

Stage 1 comprised of an initial study to identify which pollutants required further investigation;

Stage 2 required estimating, modelling or measuring pollutants where there was an indication that national objectives will not be achieved; and

Stage 3 involved using advanced modelling techniques and emissions inventories.

The final assessment (third stage report) concluded that the Air Quality Objectives would be met. There were, however, some areas of concern where levels of nitrogen dioxide from road traffic pollution were expected to be close to reaching the objective level and the need to keep these under review was recognised.

Round 2

In 2003, all local authorities were required to complete a second round of air quality reviews and assessments. The Government issued guidance to assist with this and to direct authorities on the methodology for completing the review. The first stage of the review was an Updating and Screening Assessment (USA). This was based on a checklist to identify those matters that had changed since the first review completed in 2001 and which required further assessment. The USA covered new monitoring data, new sources of pollution and other changes that affected air quality.

The Council's USA, completed in December 2003, concluded that further detailed assessments of nitrogen dioxide from road traffic sources and particulate matter from an industrial source were required to determine whether air quality objectives would be exceeded in 2005. In July 2005, further detailed assessments were completed in respect of the impact of road traffic on concentrations of nitrogen dioxide in St Margaret's Street, Norwich Road/Chevallier Street junction and the Star Lane gyratory system/St Helen's Street. The assessment was completed using a dispersion model, traffic and meteorological data and an ambient real time continuous monitor to produce concentration plots for 2005 and 2010.

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The results of the detailed assessments for nitrogen dioxide indicated that the annual mean objective pollution level would be exceeded along most of the roads under study. In places, the exceedance of the $40\mu\text{g}/\text{m}^3$ annual mean standard extended 50 metres from the kerb into residential areas.

Under Section 83(1) of the Environment Act 1995, local authorities have to designate areas with a predicted exceedance of the Air Quality Objectives as Air Quality Management Areas (AQMA). Ipswich Borough Council declared three AQMAs on the 11th of April 2006;

- *Ipswich Air Quality Management Order No 1, 2006: Norwich Road, Chevallier Street and Valley Road*

This junction is located on one of the main routes into Ipswich town centre with four roads leading into a double mini roundabout (A map of the AQMA is shown in Appendix A).

Generally, the area around this junction is open with some green space and buildings set back from the road. However, there is a public house (with flat above) and some residential flats which are both located adjacent to the junction. In addition, one road, Chevallier Street, leading from the roundabout has terraced properties facing directly onto a pavement. The predicted exceedance of the NO_2 annual mean objective levels spreads up to 25m from the kerb.

- *Ipswich Air Quality Management Order No 2, 2006: Junction of Crown Street with Fonnereau Road and St Margaret's Street and St Margaret's Plain*

This AQMA includes four roads all leading off each other (A map of the AQMA is shown in Appendix A). There are main traffic lights at the junction of St Margaret's Street and St Margaret's Plain and pedestrian crossing lights just beyond the junction of Crown Street and Fonnereau Road. The area along St Margaret's Street is partially canyoned.

St Margaret's Street is flanked by flats on one side, and a vacant building on the other. Permission has been given for this to be turned into residential dwellings. There are residential buildings on all roads within the AQMA.

- *Ipswich Air Quality Management Order No 3, 2006: Star Lane gyratory system and St Helen's Street/Grimwade Street*

The gyratory system is a circular network of one-way roads located next to the docks (A map of the AQMA is shown in Appendix A). There are many residential dwellings (mainly high-rise flats) within these areas and some commercial and office buildings. Further development of the Gyratory system and Dockside is ongoing.

Traffic flow through many of the areas of this AQMA can be congested.

In addition, the Department for Environment, Food and Rural Affairs (DEFRA) also requires that local authorities should submit annual air quality (Progress Reports) in between three yearly USAs. This is to provide a means of ensuring that air quality review is a continuous process and act as a timely indication of the need for measures to improve air quality, rather than delaying for three years until a full review is carried out. Ipswich Borough Council completed a Progress Report in September 2005.

Round 3

The third round of review and assessment commenced in 2006 to enable local authorities to determine whether Air Quality Objectives in their areas would be met by specific target dates by means of a USA review. Ipswich Borough Council completed its USA in January 2008. The USA concluded that four of the seven prescribed pollutants were likely to meet their Air Quality Objectives and as such a Detailed Assessment was not required. However, it was found that further screening works for Benzene, Nitrogen Dioxide (NO_2) and particulates (PM_{10}) were required as well as a Detailed Assessment of both NO_2 and PM_{10} at the Yarmouth Road/ Bramford Road and Chevalier Street Junction.

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The Detailed Assessment, recommended in the USA, was completed in draft in December 2009 and concluded that there are likely to be exceedances of the annual mean nitrogen dioxide objective at this location. The predicted exceedances of the objective can be attributed to slow moving vehicles, congestion and queuing traffic. For the pollutant PM₁₀, modelling indicated a very unlikely risk of exceeding the annual mean PM₁₀ objective in the base year and the future year of 2010.

The screening works resulting from the round 3 USA have been completed as part of the current, round 4, USA. At the advice of DEFRA, the information usually included in a progress report has also been incorporated into this document.

Round 4

The fourth and current round of review and assessment began in 2009. This USA report forms part of that round and is intended to identify any significant changes that may have occurred since the previous round was completed. This requires the assessment of new monitoring data, new objectives, new sources or significant changes to existing sources either locally or in neighbouring authorities and other changes that might affect air quality.

The method of carrying out a USA has changed slightly from previous rounds as a source-by-source approach is now followed instead of a review of each pollutant in turn.

Table 1.2 Summary of previous review and assessments carried out by Ipswich Borough Council

Round	Date	Type of Assessment	Conclusion/Outcome
1	March 2001	Final Assessment	Predicted that the Air Quality Objectives would be met Areas of concern where levels of nitrogen dioxide from road traffic pollution were expected to be close to reaching the objective level were kept under review.
2	December 2003	Updating and Screening Assessment	Concluded that further detailed assessments of nitrogen dioxide from road traffic sources and particulate matter from an industrial source was required to determine whether Air Quality Objectives would be exceeded in 2005.
	July 2005	Detailed Assessment	Concluded that the annual mean objective pollution level would be exceeded along most of the roads under study.
	11 th of April 2006		Declaration of 3 AQMAs.
3	January 2008	Updating and Screening Assessment	Concluded that four of the seven prescribed pollutants were likely to meet their Air Quality Objectives and as such a Detailed Assessment was not required. Recommended that further screening works for Benzene, Nitrogen Dioxide (NO ₂) and particulates (PM ₁₀) and a Detailed Assessment of both NO ₂ and PM ₁₀ at the Yarmouth Road/ Bramford Road and Chevalier Street Junction are carried out.
	January 2007	Progress Report	Data included in this Updating and Screening Report as requested by Defra
	December 2009	Detailed Assessment	Completed December 2009. Submitted December 2009. Concluded that there are likely exceedances of the NO ₂ annual objective at the Yarmouth Road/Chevalier Street junction

2 New Monitoring Data

2.1 Summary of Monitoring Undertaken

2.1.1 Automatic Monitoring Sites

Prior to April 2009, Ipswich Borough Council carried out automatic monitoring of air quality at 2 locations in the Borough.

The automatic monitors located at Piper's Court and Chevallier Street measure the concentration of NO₂ in the local air continuously.

In April 2009, the Council installed 2 additional automatic NO₂ monitors within the largest AQMA around the Star Lane gyratory system. Data from these two monitors will be included in future reports.

Table 2.1 Details of Automatic Monitoring Sites

Site Name	Site Type	OS Grid Ref	Pollutants Monitored	In AQMA ?	Relevant Exposure? (Y/N with estimated distance (m) to relevant exposure)	Estimated distance of monitor to kerb of nearest road (N/A if not applicable)	Worst-case Location ?
Pipers Court	Urban kerbside	616578 / 244759	NO ₂	Y	Yes. Residential properties located 3m from kerb.	3m	Yes
Chevallier St (Wellington Centre)	Urban kerbside	615257 / 245349	NO ₂	Y	Yes. Residential properties located 2.5m from kerb.	2.5m	Yes

Quality Assurance/Quality Control

The automatic monitors are routinely calibrated once every 2 weeks by an Environment Protection Officer and serviced once a year by the manufacturers. All data collected from the automatic monitors are managed by external consultants (AEA) to quality procedures developed under the UK National Network. The data management processes represent best practice and fully meet the requirements set out in LAQM TG(09).

All data are screened and scaled (on the basis of site calibrations) and the final data sets presented within this report have benefited from a full process of data ratification, including thorough additional data quality checks that include site UKAS quality control audits and a final data ratification process that corrects data for instrument sensitivity drift between routine calibrations

2.1.2 Non-Automatic Monitoring

Ipswich Borough Council carries out non-automatic monitoring of NO₂ using diffusion tubes located in 37 different sites in the Borough. 47 diffusion tubes monitor kerbside and roadside concentrations of NO₂ and 2 diffusion tubes monitor background concentrations of NO₂.

Ipswich Borough Council - England

Table 2.2 Details of Non- Automatic Monitoring Sites

Site Name	Site Type	OS Grid Ref	Pollutants Monitored	In AQMA?	Relevant Exposure? (Y/N with estimated distance (m) of tubes to relevant exposure)	Estimated distance of diffusion tube to kerb of nearest road	Worst-case Location?
Civic Drive	Urban roadside	615999/244399	NO ₂	N	Yes. Residential properties located approximately 3m from kerb.	3m	Y
Civic Drive co-location	Urban roadside	615999/244399	NO ₂	N	Yes. Residential properties located approximately 3m from kerb.	3m	Y
Stoke Bridge	Urban kerbside	616315/243934	NO ₂	Y	No – temporary site. Skateboard park located approximately 6m from kerb.	0.5m	Y
Wherstead Road	Urban roadside	616258/242616	NO ₂	N	Yes. Residential properties located approximately 2.5m from kerb.	2.5m	Y
Fore Street	Urban kerbside	616860/244147	NO ₂	Y	Yes. Residential properties located approximately 1.15m from kerb.	0.15m	Y
Kings Avenue	Urban background	617299/244412	NO ₂	N	Yes. Residential properties located approximately 15m from kerb.	10m	Y
Nacton Road/Mar yon Road*	Urban roadside	618971/242296	NO ₂	N	Yes. Residential properties located approximately 15m from kerb.	10m	Y
Nacton Rd/A14 junct*	Urban roadside	620076/241281	NO ₂	N	Yes. Residential properties located approximately 15m from the kerb.	2m	Y
Nacton Rd/A14 junct*	Urban roadside	620076/241281	NO ₂	N	Yes. Residential properties located approximately 15m from the	2m	Y

Ipswich Borough Council - England

					kerb.		
Woodbridge Rd East*	Urban roadside	619317/245127	NO ₂	N	Yes. Residential properties located approximately 8m from the kerb.	4m	Y
St Margaret's Street, Pipers Court	Urban roadside	616578/244759	NO ₂	Y	Yes. Residential properties located approximately 3m from kerb.	3m	Y
St Margaret's Street, Pipers Court co-location	Urban roadside	616578/244759	NO ₂	Y	Yes. Residential properties located approximately 3m from kerb.	3m	Y
St Margaret's Street, Pipers Court co-location	Urban roadside	616578/244759	NO ₂	Y	Yes. Residential properties located approximately 3m from kerb.	3m	Y
Valley/Norwich Road	Urban kerbside	615342/245422	NO ₂	Y	Yes. Residential properties located approximately 5m from the kerb.	1m	Y
Valley/Norwich Road	Urban roadside	615361/245436	NO ₂	Y	Yes. Residential properties located approximately 5m from the kerb.	2m	Y
Valley/Norwich Road	Urban roadside	615361/245436	NO ₂	Y	Yes. Residential properties located approximately 5m from the kerb.	2m	Y
Tavern Street	Urban centre background	616277/244641	NO ₂	N	Yes. Shops located approximately 0.5m from kerb. Pedestrian-only road with limited traffic flow in the morning and evening for loading and unloading.	0.5m	Y
Chevallier Street, outside number 63	Urban roadside	615283/245391	NO ₂	Y	Yes. Residential properties located approximately 1.25m from kerb.	1.25m	Y
Chevallier	Urban	615283/	NO ₂	Y	Yes.	1.25m	Y

Ipswich Borough Council - England

Street, outside number 63	roadside	245391			Residential properties located approximately 1.25m from kerb.		
Norwich Road outside number 331	Urban roadside	614997/ 245804	NO ₂	N	Yes. Residential located approximately 4m from kerb.	2m	Y
Norwich/Bl enheim Road	Urban roadside	615269/ 245460	NO ₂	Y	Yes. Residential properties located approximately 6.5m from kerb.	3m	Y
St Margaret's Plain/Fonn ereau Road	Urban kerbside	616455/ 244824	NO ₂	Y	Yes. Flats and shops located approximately 1m from kerb.	1m	Y
St Margaret's Plain	Urban kerbside	616490/ 244806	NO ₂	Y	Yes. Residential located approximately 1m from kerb, 9m down road from tube.	1m	Y
St Margaret's Plain/Nort hgate St	Urban kerbside	616477/ 244790	NO ₂	Y	Yes. Public house located approximately 1m from kerb.	1m	Y
St Margaret's Green/ St Margaret's Street	Urban roadside	616640/ 244741	NO ₂	Y	No. Offices located approximately 2m from kerb.	1.5m	Y
St Margaret's Street	Urban roadside	616659/ 244689	NO ₂	Y	No. Placed to define boundary of AQMA	2m	Y
St Helen's Street	Urban roadside	616750/ 244578	NO ₂	Y	Yes. Flats located approximately 2m from kerb.	1.5m	Y
St Helen's St/Grimwa de Street	Urban roadside	616950/ 244517	NO ₂	N	Yes. Residential properties located approximately 3m from kerb.	3m	Y
St Helen's St/Argyle Street	Urban roadside	616961/ 244536	NO ₂	Y	Yes. Flats located approximately 4m from kerb.	3.5m	Y
St Helen's St/Dove Street	Urban kerbside	617023/ 244508	NO ₂	Y	Yes. Public house and flats located approximately 1m from kerb.	1m	Y
Fore Hamlet	Urban roadside	617102/ 244077	NO ₂	Y	Yes. Flats located approximately	2m	Y

Ipswich Borough Council - England

					2.15m from kerb.		
Fore Street	Urban roadside	616963/244106	NO ₂	Y	Yes. Flats located approximately 3m from kerb.	3m	Y
Key Street	Urban roadside	616699/244099	NO ₂	Y	No. Offices located approximately 2m from kerb. Placed for co-location with continuous monitor (but monitor delayed)	2m	Y
Key Street co locate	Urban roadside	616699/244099	NO ₂	Y	No. Offices located approximately 2m from kerb. Placed for co-location with continuous monitor (but monitor delayed)	2m	Y
Key Street co locate	Urban roadside	616699/244099	NO ₂	Y	No. Offices located approximately 2m from kerb. Placed for co-location with continuous monitor (but monitor delayed)	2m	Y
Key Street/Foundation Street	Urban roadside	616502/244083	NO ₂	Y	Yes. Church located approximately 8m from kerb.	8m	Y
College Street	Urban roadside	616341/244095	NO ₂	Y	Yes. Church located approximately 3.5m from kerb.	2m	Y
Star Lane/St Peter's Street	Urban roadside	616307/244141	NO ₂	Y	No. Hotel located approximately 5m from kerb.	3m	Y
Lower Brook Street	Urban roadside	616480/244163	NO ₂	Y	Yes. Flats and offices located approximately 2.8m from kerb.	2.5m	Y
Star Lane	Urban kerbside	616664/244177	NO ₂	Y	No. Offices located approximately 1.5m from kerb.	0.5m	Y
Star Lane/Fore Street	Urban kerbside	616730/244246	NO ₂	Y	Yes. Flats and offices located approximately 2m from kerb.	0.5m	Y
Star Lane, Angel Lane	Urban roadside	616786/244260	NO ₂	Y	No. Offices located approximately 1.5m from	1.5m	Y

Ipswich Borough Council - England

					kerb. Placed for co-location with continuous monitor (but monitor delayed)		
Star Lane, Angel Lane co-location	Urban roadside	616786/244260	NO ₂	Y	No. Offices located approximately 1.5m from kerb. Placed for co-location with continuous monitor (but monitor delayed)	1.5m	Y
Star Lane, Angel Lane co-location	Urban roadside	616786/244260	NO ₂	Y	No. Offices located approximately 1.5m from kerb. Placed for co-location with continuous monitor (but monitor delayed)	1.5m	Y
Yarmouth Rd/Bramford Road	Urban roadside	615107/245197	NO ₂	N	Yes. Residential properties located approximately 3.5m from kerb.	3m	Y
Bramford Road	Urban roadside	615049/245234	NO ₂	N	Yes. Residential properties located approximately 4m from kerb.	1.5m	Y
Chevallier Street, Wellington Centre	Urban roadside	615257/245349	NO ₂	Y	Yes. Children's centre located approximately 2.5m from kerb.	2.5m	Y
Chevallier Street, Wellington Centre co-location	Urban roadside	615257/245349	NO ₂	Y	Yes. Children's centre located approximately 2.5m from kerb.	2.5m	Y
Chevallier Street, Wellington Centre co-location	Urban roadside	615257/245349	NO ₂	Y	Yes. Children's centre located approximately 2.5m from kerb.	2.5m	Y
Norwich Road/Anglesea Road	Urban roadside	615397/245337	NO ₂	N	Yes. Residential hotel located approximately 7m from kerb.	1.5m	Y
St Matthews Street	Urban kerbside	615803/244872	NO ₂	N	Yes. Residential properties located approximately	1m	Y

Ipswich Borough Council - England

					1.15m from kerb.		
The diffusion tubes marked with an * were relocated in May 2008 to the locations outlined below:							
Site Name	Site Type	OS Grid Ref	Pollutants Monitored	In AQMA?	Relevant Exposure? (Y/N with distance (m) to relevant exposure)	Approximate distance of diffusion tube to kerb of nearest road	Worst-case Location?
Nacton Road	Urban roadside	618974/242291	NO ₂	N	Yes. Residential properties located approximately 5m from kerb.	1.5m	Y
Nacton Rd/A14 junct	Urban roadside	620078/241263	NO ₂	N	Yes. Residential properties located approximately 9m from kerb.	6m	Y
Nacton Rd/A14 junct	Urban roadside	620078/241263	NO ₂	N	Yes. Residential properties located approximately 9m from kerb.	6m	Y
Woodbridge Rd East	Urban roadside	619294/245109	NO ₂	N	Yes. Residential properties located approximately 8m from kerb.	8m	Y

Whilst most of the tubes are located in areas representative of public exposure, some tubes are not. Whilst every effort is made to locate the monitoring points at relevant receptor locations, it is sometimes necessary to compromise due to a shortage of suitable locations. A number of tubes were positioned within the AQMA area to assist in the assessment of the AQMA boundary modelling. There were no exceedences at any monitoring sites that were not representative of public exposure.

Quality Assurance/Quality Control

The tubes are supplied by Bureau Veritas and analysed by Gradko International Limited, based in Winchester. The WASP results indicated that Gradko achieved a 'Good' rating in 2008.

The preparation up to the end of the 2008 period is 50% TEA in acetone and the method is as described in the Harmonisation Practical Guidance for the laboratory. The laboratory follows all the procedures set out in the Guidance except for the temperature dependent co-efficient.

For 2007 data, the bias adjustment factor applied to the annual means from the diffusion tubes was 0.91. This figure was calculated by AEA Energy and Environment using the monthly values collected from the triplicate tubes co-located with the automatic analyser at St. Margarets Street (Pipers Court). A 82% data capture was obtained but was adjusted by AEA Energy and Environment to ensure a 95% data capture for the months used for bias adjustment. For 2008 data, the bias adjustment factor being applied to the annual means from the diffusion tubes is 0.91. This figure was calculated by AEA Energy and Environment using the monthly values collected from the triplicate tubes co-located with the automatic analysers at Chevallier Street. A 93% data capture was obtained from the automatic monitors at that location whereas an 57.5% data capture was obtained at Piper's Court which was deemed insufficient to enable the derivation of a bias adjustment factor.

2.2 Comparison of Monitoring Results with AQ Objectives

In 2007 and 2008, Ipswich Borough Council monitored NO₂ using automatic and non-automatic equipment.

2.2.1 Nitrogen Dioxide

The Government's Air Quality Objectives for NO₂ are:

- An annual mean concentration of 40 µg/m³. This objective was to be achieved by the end of 2005;
- A 1-hour mean of 200 µg/m³, not to be exceeded more than 18 times in a year. This objective was to be achieved by the end of 2005.

The first Air Quality Daughter Directive also sets limit values for nitrogen dioxide, which have been transposed into UK legislation. The Directive includes:

- An annual mean limit value of 40 µg/m³ to be achieved by 1 January 2010.
- A 1-hour limit value of 200 µg/m³, not to be exceeded more than 18 times in a year, to be achieved by 1 January 2010.

Meeting the 2005 annual mean objective and the limit value in 2010 is expected to be considerably more demanding than achieving the 1-hour objective. Projections for 2010 indicate that the EU limit value may still be exceeded at urban background sites in London, and at roadside locations in other cities.

This authority's 2008 Updating and Screening Assessment concluded that further detailed assessments were required to study the impact of traffic on concentrations of nitrogen dioxide.

Automatic Monitoring Data

None of the automatic monitors recorded exceedences of the 200 µg/m³ 1-hour mean for NO₂ over the 12-month period under consideration.

The monitor at Piper's Court recorded exceedences of the 40 µg/m³ annual mean NO₂ objective in both 2007 and 2008, although the data capture at that location is so low during 2008 (57.5%) due to machine faults that the reliability of this information must be treated with caution.

The monitor at Chevallier Street recorded no exceedence of the 40 µg/m³ annual mean NO₂ objective during 2007 or 2008. The data capture at this location during 2007 was 72% and therefore the results must be treated with caution. However, the data capture in 2008 is 93% and this information can be treated as being reliable.

It was previously reported that 2006 data was unreliable due to significant faults with the instrument.

Table 2.3a Results of Automatic Monitoring for Nitrogen Dioxide: Comparison with Annual Mean Objective

AQMA	Location	Proportion of year with valid data 2007/2008 (%)		Annual mean concentrations (µg/m ³)		
		2007	2008	2006	2007	2008
AQMA1 -Norwich Road/Valley Road	Chevallier Street	72	93	36	32	31

Ipswich Borough Council - England

AQMA 2 – St-Margarets	Piper's Court	82	57.5	64	43	46
AQMA 3 – Star Lane	No monitor		-	-	-	-

Table 2.3b Results of Automatic Monitoring for Nitrogen Dioxide: Comparison with 1-hour Mean Objective

AQMA	Location	Proportion of year with valid data 2007/2008 (%)		Number of exceedances of hourly objective ($\mu\text{g}/\text{m}^3$)		
		2007	2008	2006	2007	2008
AQMA1 -Norwich Road/Valley Road	Chevallier Street	72	93	0	0	0
AQMA 2 – St-Margarets	Piper's Court	82	57.5	4 (4days)	0	0
AQMA 3 – Star Lane	No monitor		-	-	-	-

Diffusion Tube Monitoring Data

The data capture from all the monitoring tubes averaged 86% for both 2007 and 2008 with a standard deviation of 2.6 from January 2008 to December 2008 and with a standard deviation of 1.6 from January 2007 to December 2007.

During 2007 there were exceedances of the annual mean of $40 \mu\text{g}/\text{m}^3$ at 3 locations within the Borough. These were all within the AQMA areas. During 2008, there were exceedances of the annual mean of $40 \mu\text{g}/\text{m}^3$ at 5 locations within the Borough. 3 of these locations are present within the existing AQMAs except for St Helen's Street and St Matthew's Street which are found outside the AQMAs.

The monitoring point on *St-Helen's Street* is located in between the 2 AQMA sections which form the St-Margaret's AQMA and Star Lane gyratory AQMA. The street leads to the bus station and is in constant use by buses. Traffic lights are located at a junction known as Major's Corner (about 20m away from the location of the diffusion tube), which can lead to stop-start traffic on St-Helen Street. The data capture at that location was 100% during 2008.

St Matthew's Street is located between the St-Margaret's Street AQMA and the Norwich Road/Valley Road AQMA. The diffusion tube is situated in proximity to a busy four-point exit roundabout which can result in traffic standing still at peak times. The data capture at that location was 100% during 2008.

During 2008, the locations within the AQMAs where exceedances of the $40 \mu\text{g}/\text{m}^3$ annual mean NO_2 objective were recorded are:

- St-Margaret's Street within St-Margaret's Street AQMA (50 to 58% data capture)
- Chevalier Street within Norwich Road/Valley Road AQMA (100% data capture)
- Star Lane/Fore Street within Star Lane AQMA (92% data capture)

It was also noted that borderline measurements (greater than $39 \mu\text{g}/\text{m}^3$) were obtained at 5 locations during 2008;

- St Margaret's Street within St-Margaret's Street AQMA (100% data capture)
- St Helen's Street/Argyle Street within St Margaret's Street AQMA (100% data capture)
- Star Lane co-location within Star Lane AQMA (100% data capture)
- Fore Street within Star Lane AQMA (92% data capture)
- Yarmouth Road/ Bramford Road outside an AQMA (83% data capture)

Ipswich Borough Council - England

The Yarmouth Road/ Bramford Road junction is located approximately 180m south west of the Norwich Road/Valley Road AQMA which suffers from queuing traffic at the double-mini roundabouts. The junction also leads to and from the A14 and to and from the town centre, again leading to slow traffic. This junction will continue to be monitored for any exceedences.

Table 2.4a Results of Nitrogen Dioxide Diffusion Tubes 2007

Location	Within AQMA?	Data Capture 2007 %	2007 - annual mean concentrations ($\mu\text{g}/\text{m}^3$)	
			Adjusted for bias #	Adjusted for bias and corrected for fall-out
Civic Drive	N	91.7	26.1	26.1
Civic Drive co-location	N	66.7	25.6	25.6
Stoke Bridge	Y	100	29.3	
Wherstead Road	N	100	28.1	28.1
Fore Street	Y	100	42	42
Kings Avenue	N	91.7	18.9	
Nacton Road	N	100	25.4	24.4
Nacton Rd/A14 junct*	N	91.7	36.2	29.5
Nacton Rd/A14 junct*	N	91.7	37.9	30.4
Woodbridge Rd East*	N	83.3	39.9	36
St Margaret's Street, Pipers Court	Y	66.7	41.7	40
St Margaret's Street, Pipers Court co-location	Y	75	41.8	40.1
St Margaret's Street, Pipers Court co-location	Y	83.3	41.5	39.8
Valley/Norwich Road *	Y	83.3	39.2	35.7
Valley/Norwich Road *	Y	75	38.6	35.3
Tavern Street	N	100	26.2	
Chevallier Street, Outside number 63	Y	100	46.7	46.7
Chevallier Street, outside number 63 co-locate	Y	100	47.2	47.2
Norwich Road *	N	58.3	34.6	32.3
The diffusion tubes marked with an * were relocated in November 2007. Results have not been included for the final two months data at the new locations due to the short time period.				

Key:

: A bias-adjustment factor of 0.91 was used. This was a local bias adjustment factor.

Data-captures of less than 90% over a 12-month period are shown in *italics*.

Exceedences of the 40 $\mu\text{g}/\text{m}^3$ annual mean NO₂ objective are shown in **bold**.

Ipswich Borough Council - England

Table 2.4b Results of Nitrogen Dioxide Diffusion Tubes 2008

Location	Within AQMA?	Data Capture 2008 %	2008 - annual mean concentrations ($\mu\text{g}/\text{m}^3$)	
			Adjusted for bias #	Adjusted for bias and corrected for fall-out
Civic Drive	N	83.3	27.9	27.9
Civic Drive co-location	N	91.7	27.3	27.3
Stoke Bridge	Y	100.0	28.7	24.4
Wherstead Road	N	100.0	26.6	26.6
Fore Street	Y	100.0	38.9	38.9
Kings Avenue	N	58.3	18.0	
Nacton Road/Maryon Road*	N	33.3	24.4	23.8
Nacton Rd/A14 junct*	N	25.0	37.6	29.6
Nacton Rd/A14 junct*	N	25	36.5	29.0
Woodbridge Rd East*	N	33.3	42.6	38.3
St Margaret's Street, Pipers Court	Y	58.3	45.5	45.5
St Margaret's Street, Pipers Court co-location	Y	58.3	44.7	44.7
St Margaret's Street, Pipers Court co-location	Y	58.3	42.4	42.4
Valley/Norwich Road	Y	100.0	37.8	34.1
Valley/Norwich Road	Y	100.0	37.3	33.7
Tavern Street	N	83.3	25.2	
Chevallier Street, outside number 63	Y	100.0	44.1	41.9
Chevallier Street, outside number 63	Y	91.7	42.8	42.8
Norwich/Blenheim Road	Y	100.0	28.4	27.0
St Margaret's Plain/Fonnereau Road	Y	100.0	33.9	33.9
St Margaret's Plain	Y	91.67	31.7	31.7
St Margaret's Plain/Northgate St	Y	91.7	36.7	36.7
St Margaret's Green/ St Margaret's Street	Y	100.0	32.6	31.8
St Margaret's Street	Y	100.0	41.7	39.7
St Helen's Street	N	100.0	44.5	43.0
St Helen's St/Grimwade	Y	100.0	36.6	36.6

Ipswich Borough Council - England

Street				
St Helen's St/Argyle Street	Y	100.0	39.9	39.2
St Helen's St/Dove Street	Y	100.0	29.4	29.4
Fore Hamlet	Y	100.0	31.9	31.7
Fore Street	Y	91.7	39.1	39.1
Key Street	Y	100.0	36.3	36.3
Key Street co locate	Y	91.7	36.9	36.9
Key Street co locate	Y	100.0	37.1	37.1
Key Street/Foundation Street	Y	100.0	31.1	31.1
College Street	Y	100.0	44.2	37.1
Star Lane/St Peter's Street	Y	100.0	38.3	36.0
Lower Brook Street	Y	100.0	28.0	27.8
Star Lane	Y	100.0	36.8	36.8
Star Lane/Fore Street	Y	91.7	45.0	45.0
Star Lane, opposite St- Peter's Street	Y	100.0	38.4	38.4
Star Lane, opposite St- Peter's Street co- location	Y	100.0	39.3	39.3
Star Lane, opposite St- Peter's Street co- location	Y	100.0	38.1	38.1
Yarmouth Rd/Bramford Road	N	83.3	39.9	39.1
Bramford Road	N	100.0	34.2	31.3
Chevallier Street, Wellington Centre	Y	100.0	30.2	28.9
Chevallier Street, Wellington Centre co-location	Y	91.7	32.2	30.7
Chevallier Street, Wellington Centre co-location	Y	100.0	31.9	30.4
Norwich Road/Anglesea Road	N	100.0	27.8	25.4
St Matthews Street	N	100.0	45.8	45.8
The diffusion tubes marked with an * were relocated in May 2008 to the locations outlined below:				
Nacton Road	N	66.7	27.2	25.4
Nacton Rd/A14 junct	N	66.7	27.7	27.0
Nacton Rd/A14 junct	N	66.7	27.3	26.3
Woodbridge Rd East	N	66.7	23.2	23.2

Ipswich Borough Council - England

Key:

: A bias-adjustment factor of 0.91 was used. This was a local bias adjustment factor.

Data-captures of less than 90% over a 12-month period are shown in *italics*.

Exceedences of the 40 µg/m³ annual mean NO₂ objective are shown in **bold**.

For comparison, Appendix B shows the location of the diffusion tubes within the separate AQMAs together with charts showing trends in nitrogen dioxide concentrations from 2005 to 2008. Although full sets of data were not available throughout the period, it can be seen from the charts that the concentration of nitrogen dioxide at the sites monitored within the Borough is generally falling and is in most cases lower than the concentration obtained in the previous years.

Appendix B also shows the location of the diffusion tubes not in AQMA areas and indicate the nitrogen dioxide concentrations obtained at those points.

3 Road Traffic Sources

The construction of almost all new roads in Ipswich is related to the development of residential estates. In 2007/ 2008, the Highways Department at Ipswich Borough Council have confirmed that no new roads or junctions were constructed within the Borough. There was also no re-routing of traffic or increase in the flow of traffic during that period.

3.1 Narrow Congested Streets with Residential Properties Close to the Kerb

Ipswich Borough Council confirms that there are no new/newly identified congested streets with a flow above 5,000 vehicles per day and residential properties close to the kerb, that have not been adequately considered in previous rounds of Review and Assessment.

3.2 Busy Streets Where People May Spend 1-hour or More Close to Traffic

Ipswich Borough Council confirms that there are no new/newly identified busy streets where people may spend 1 hour or more close to traffic since the last Updating and Screening Assessment undertaken in January 2008.

3.3 Roads with a High Flow of Buses and/or HGVs.

Ipswich Borough Council confirms that there are no new/newly-identified roads with high flows of buses/HGVs since the last Updating and Screening Assessment undertaken in January 2008.

3.4 Junctions

There are no new/newly identified busy junctions/busy roads since the last Updating and Screening Assessment undertaken in January 2008.

In the previous USA report, 4 junctions were identified as requiring modelling once the appropriate traffic data became available. This data has become available and the modelled junctions are:

- Foxhall Road/ Heath Road/ Bixley Road
- Landseer Road/ Nacton Road/ Rands Way
- Civic Drive/ Princes Street/ Franciscan Way
- St Matthew's Street/ Berners Road/ Civic Drive

The DMRB screening model was used to predict the annual mean nitrogen dioxide levels, the annual mean PM₁₀ levels and the daily mean PM₁₀ levels at relevant receptor locations. The results of the modelling are provided in detail in Appendix D.

Ipswich Borough Council - England

8 receptor locations were modelled at the Foxhall Road/ Heath Road/ Bixley Road junction, 5 receptor locations were modelled at the Landseer Road/ Nacton Road/ Rands Way junction and 4 receptor locations each at the St Matthew's Street/ Berners Road/ Civic Drive and the Civic Drive/ Princes Street/ Franciscan Way junctions.

There were no predicted exceedences of the PM₁₀ annual mean and daily mean objectives at any of the receptor locations.

When the model was verified to adjust the nitrogen oxides road contribution using the diffusion tubes results, it was noted that the results based on the dispersion model for NO₂ was clearly under predicting at the St Matthew's Street/ Berners Road/ Civic Drive junction whereas it was over predicting at the Landseer Road/ Nacton Road/ Rands Way junction.

The model was therefore adjusted based on road source contribution of NO_x as detailed in TG(09). This verification/adjustment is shown in Appendix C.

The adjusted model was verified and showed no tendency to over or under predict at the junctions mentioned earlier.

The adjusted model predicted an NO₂ annual mean of 45.8µg/m³ which is in exceedence of the 40µg/m³ air quality objective at the St Matthew's Street/ Berners Road/ Civic Drive junction.

A detailed assessment of the predicted NO₂ concentrations at the St Matthew's Street/ Berners Road/ Civic Drive junction is required to determine whether the declaration of an Air Quality Management Area is necessary.

Ipswich Borough Council confirms that there are no new/newly identified busy junctions/busy roads since the last Updating and Screening Assessment undertaken in January 2008.

Ipswich Borough Council has assessed the junctions previously identified in the January 2008 USA report meeting the criteria in Section A.4 of Box 5.3 in TG(09), and concluded that **it will be necessary to proceed to a detailed assessment for NO₂** at the St Matthew's Street/ Berners Road/ Civic Drive junction.

3.5 New Roads Constructed or Proposed Since the Last Round of Review and Assessment

Ipswich Borough Council confirms that there are no new/proposed roads since the last Updating and Screening Assessment undertaken in January 2008.

3.6 Roads with Significantly Changed Traffic Flows

Ipswich Borough Council confirms that there are no new/newly identified roads with significantly changed traffic flows.

3.7 Bus and Coach Stations

Ipswich Borough Council confirms that there are no relevant bus stations in the Local Authority area since the last Updating and Screening Assessment undertaken in January 2008.

4 Other Transport Sources

4.1 Railways (Diesel and Steam Trains)

New evidence has shown that NO₂ concentrations are elevated alongside rail lines with a large number of diesel locomotive movements. No rail lines with a heavy traffic of diesel passenger trains operate within the Ipswich area and/or meet the criteria set out in the guidance documents.

4.1.1 Stationary Trains

Ipswich Borough Council confirms that there are no locations where diesel or steam trains are regularly stationary for periods of 15 minutes or more, with potential for relevant exposure within 15m.

4.1.2 Moving Trains

Ipswich Borough Council confirms that there are no locations with a large number of movements of diesel locomotives, and potential long-term relevant exposure within 30m.

4.2 Ports (Shipping)

The Port of Ipswich is located within the Borough. The port is equipped to handle containers, dry bulks, forest products, general cargo, liquid bulks and ro-ros.

Relevant exposure is present within 1km of the berths and main areas of manoeuvring. The Berthing Officer at the Port has advised that there were 1173 shipping movements between January and December 2008 as detailed below:

354 ro-ros,
555 bulk vessels,
75 timber vessels,
57 container ships,
81 tankers and
51 others (e.g. customs vessels).

The number of shipping movements is significantly less than the minimum movement of 15,000 per year stipulated by DEFRA. As such;

Ipswich Borough Council confirms that there are no ports or shipping that meet the specified criteria within the Borough.

5 Industrial Sources

5.1 Industrial Installations

5.1.1 New or Proposed Installations for which an Air Quality Assessment has been Carried Out

There are no new or proposed installations in the vicinity of the Ipswich Borough Council boundary as confirmed by officers of Babergh District Council, Mid Suffolk District Council and Suffolk Coastal District Council. Planning applications received in 2007 and 2008 were checked for new installations or proposed installations. None were identified. There were no applications for installations likely to give rise to significant pollution emissions. The Environment Agency confirmed that there were no new Part A1 installations in the Borough during the year 2007 and 2008.

Ipswich Borough Council confirms that there are no new or proposed industrial installations for which planning approval has been granted within its area or nearby in a neighbouring authority.

5.1.2 Existing Installations where Emissions have Increased Substantially or New Relevant Exposure has been introduced

The Environment Agency was consulted to verify whether there had been any substantial increase in emissions from the existing Part A1 installations. They confirmed that there had been no such increase during the period under consideration in this report.

A Part A2 process was closed during the year 2008 which resulted in a cessation of emissions from that installation. Ipswich Borough Council currently has no Part A2 process. There were no substantial increases in emissions from the existing Part B processes.

Planning applications received in 2008 in the vicinity of existing installations were checked to determine whether new residential or any other relevant application likely to introduce receptors were proposed.

Ipswich Borough Council confirms that there are no industrial installations with substantially increased emissions or new relevant exposure in their vicinity within its area or nearby in a neighbouring authority.

5.1.3 New or Significantly Changed Installations with No Previous Air Quality Assessment

Six applications for the operation of new installations were received in 2007. These were for new dry cleaning processes and as such were not considered significant for the purposes of this report.

Three applications for the operation of new installations were received in 2008. These were for a new cement batching plant, a new roadstone coating plant and the construction of a new cement silo at an existing installation. These installations are all located in the port of Ipswich area. No air quality assessment was undertaken. Approach 3 in Section C.1 of Box 5.5 of TG (09) was used to determine if each installation was likely to give rise to significant pollutant emissions.

It was deemed that the proposed new silo and new cement batching plant would not give rise to significant pollutant emissions because of the mandatory emissions control using Best Available

Ipswich Borough Council - England

Techniques directed by the Environmental Permitting Regulations. Under this regime, dust control systems on new silos are limited to emit a maximum of 10mg/m³ of PM₁₀.

The roadstone coating plant is also limited to emit a maximum of 50mg/m³ of PM₁₀ under the Environmental Permitting Regulations.

The total annual emissions of PM₁₀ was not yet available in the National Atmospheric Emissions Inventory database. The emissions for the year 2006 for a similar type of installation located at the Ipswich Docks was obtained from the database. The source was not found to exceed the nomogram in TG(09) and as such no detailed assessment is considered necessary.

Ipswich Borough Council has assessed new/proposed industrial installations, and concluded that it will not be necessary to proceed to a Detailed Assessment.

5.2 Major Fuel (Petrol) Storage Depots

There is some evidence that major petrol fuel depots could emit sufficient benzene to put the 2010 objective at risk of being exceeded, especially if combined with higher levels from nearby busy roads. TG (09) has revised the classification of the Vopak Terminal, Cliff Quay (Grid reference 617200 242800) as a 'Large Major Fuel (Petrol) Storage Depot'. The Vopak Terminal is permitted under the Pollution Prevention and Control Act 2000. Its current permit allows for up to 10, 000 tonnes of petroleum to be stored and distributed by road tanker. The distance of the nearest relevant exposure (i.e. building facades of residential properties) is approximately 65m and the height of the petrol tank is 13m.

The Local Authority Support helpdesk has provided the tonnage of annual emissions of benzene from the terminal from 1998 to 2007. An annual average was calculated from 2003 to 2007 to take into account any changes to the installation made in the last 5 years as well as the site's revised Part B permit. A value of 0.0833 tonnes/year of benzene from point sources was calculated. This value was compared to the threshold obtained from the relevant nomogram in TG(09). The source value was below the threshold and as such a detailed assessment is not necessary.

Ipswich Borough Council has assessed a major petrol storage depot, and concluded that it will not be necessary to proceed to a detailed assessment.

5.3 Petrol Stations

The USA produced in January 2008 confirmed that there were no petrol stations in the district which have relevant receptor locations within 10m of the pumps and no further assessment within regards to benzene were therefore considered necessary. This USA confirms that the conclusions made in the previous USA in relation to petrol stations remain unchanged.

Ipswich Borough Council confirms that there are no petrol stations meeting the specified criteria.

5.4 Poultry Farms

Ipswich Borough Council has consulted with the Environment Agency to identify any poultry farms permitted under the Integrated Pollution Prevention and Control Regulations. The Environment

Ipswich Borough Council - England

Agency has confirmed that no poultry farms were permitted within the Borough or in the vicinity of the Borough Boundary.

Ipswich Borough Council confirms that there are no poultry farms meeting the specified criteria.

6 Commercial and Domestic Sources

6.1 Biomass Combustion – Individual Installations

Ipswich Borough Council permits a Part B installation at Nacton Road, whereby waste wood from the process is disposed of by combustion in a wood-burning boiler. The net rated thermal input of the boiler is 2.90MW. Solid waste wood is broken into chips by a hogging machine and stored in a silo prior to disposal.

The following information was obtained from the operator and available monitoring records:

Height of stack: 16m

Diameter of stack: 0.5m

Dimensions of buildings within 5 times the stack height (above ground): 9.5m

Emission rate of PM₁₀: 0.286g/s

The background adjusted emission rate was calculated to be 0.022g/s.

The effective stack height was calculated to be 10.79m.

Using the nomogram in Figure 5.19 of TG(09), the threshold emission rate was determined to be 0.006g/s. As the adjusted emission rate exceeds the threshold emission rate, it is necessary to proceed to a detailed assessment.

No emission limit values were available for NO₂. It was therefore not possible to determine whether the source required further assessment with respect to that pollutant.

Ipswich Borough Council has assessed the biomass combustion plant at Nacton Road, and concluded that **it will be necessary to proceed to a Detailed Assessment for particulate matter. As part of the Detailed Assessment, consideration will be given to NO₂ emissions.**

A 50kW biomass boiler is located at the Reg Driver Visitor Centre at Christchurch Park in Ipswich. The plant burns woodchips to heat the building and water.

The following information was obtained from the site manager:

Height of stack: 5-6m

Diameter of stack: 30cm

Dimensions of buildings within 5 times the stack height (above ground): 3m No buildings other than visitor centre in which stack is located.

Whilst it is possible to calculate the threshold emission rate using this information, it is not possible to calculate the adjusted emission rate as the emission rates of neither PM₁₀ nor NO₂ was available. The maximum thermal capacity of the plant was not available either to estimate the emission rates from the EMEP/ CORINAIR Guidebook.

It is therefore not possible at this time to determine whether the biomass combustion plant at Christchurch Park requires a detailed assessment.

Ipswich Borough Council has assessed the biomass combustion plant at the Reg Driver Centre, and concluded that **further screening work will be undertaken as part of the Detailed Assessment for particulate matter. As part of the Detailed Assessment, consideration will be given to NO₂ emissions.**

6.2 Biomass Combustion – Combined Impacts

According to TG(09), many small biomass combustion installations including domestic solid-fuel burning could in combination lead to unacceptably high emissions of PM₁₀.

The assessment requires the identification of areas in 500x500m squares with the highest densities of houses and service sector biomass combustion appliances in order to determine the annual service sector and annual domestic emissions. The Private Sector Housing Team at Ipswich Borough Council conducted a Stock Condition Survey in 2004 whereby a random selection of properties was surveyed. Information relating to the locations of properties using solid fuel had not been derived from the survey to enable an assessment of the density of installations. As this information was not readily available and as the information is 5 years out of date, it was considered that the costs and officer time required to carry out an appropriate Borough-wide survey in order to obtain this information would be unjustified and would lead to considerable delays in submitting this USA report.

As such, officer experience was taken into account, which suggested that there were no areas in the Borough where significant coal burning takes place. The Solid Fuel Association confirmed that the number of coal merchants in the Approved Coal Merchants Scheme was unchanged since 2006. It is understood from the Southern England Regional Coordinator of the Approved Coal Merchants scheme that since 2003, the merchants have not increased their tonnage band and that the overall burn of solid fuel in domestic appliances in Suffolk has declined.

Owing to the urban nature of the Borough and taking into account the above information, it is considered that the combined impacts of biomass combustion installations does not warrant a further assessment at this time.

6.3 Domestic Solid-Fuel Burning

As stated in the previous section, officer experience indicated that there were no areas in the Borough where significant coal burning takes place. The Solid Fuel Association confirmed that the number of coal merchants in the Approved Coal Merchants Scheme was unchanged since 2006. It is understood from the Southern England Regional Coordinator of the Approved Coal Merchants scheme that since 2003, the merchants have not increased their tonnage band and that the overall burn of solid fuel in domestic appliances in Suffolk has declined.

Ipswich Borough Council confirms that there are no areas of significant domestic fuel use in the Local Authority area.

7 Fugitive or Uncontrolled Sources

According to TG(09), dust emissions from a number of uncontrolled and fugitive sources can give rise to elevated PM₁₀ concentrations. Such sources include;

- Quarrying and mineral extractions
- Landfill sites
- Coal and material stockyards or materials handling
- Major construction works
- Waste management sites

Suffolk County Council has confirmed that there are no quarries, mineral extraction sites, waste management sites and landfill sites within the Borough.

Ipswich Borough Council permits two Part B installations known as Associated British Ports and Cemex. Both sites are located at the Port of Ipswich and undertake the loading and unloading of coal and coal products. It is understood from officer inspections to these sites that the storage of coal and coal products is rare. The Council has not received dust complaints about these installations between January 2008 and December 2008. A dust complaint was received about the unloading of fertiliser at the Port of Ipswich in 2007. The complaint was investigated and not found to be substantiated.

Major construction works have taken place between January 2007 and December 2008 on College Street, Ipswich. Although relevant exposure is classed as 'near' as per the definition in TG(09), no dust complaints have been received during the period mentioned above.

From January 2008 to December 2008, Ipswich Borough Council received one dust complaint, allegedly emanating from a Part B installation known as Southern Cement Ltd which is permitted for the blending, packing and unloading of cement. The installation located at the Port of Ipswich offloads bulk cement in powder form by ship into a shed and subsequently stores the cement prior to discharge to bulk road tankers. Investigation into this complaint has found it to be unfounded. The relevant exposure is located over 450m away from the source and the background PM₁₀ concentration of 18.4µg/m³ at the installation is less than 26µg/m³ (as stipulated in TG(09)). During 2009, further complaints of dust from this installation have been received. Investigations are ongoing.

A metal scrap yard started operating in November/December 2008 at the Port of Ipswich. Dust complaints have been received in 2009 and Ipswich Borough Council is currently investigating.

A grain terminal is located adjacent to the Part B installation known as Southern Cement Ltd. The grain terminal stores grain into silos and loads and unloads grain into ships. The relevant exposure is located over 450m away from the source and the background PM₁₀ concentration of 18.4µg/m³ (from the LAQM estimated background pollution maps) at the installation is less than 26µg/m³ (as stipulated in TG(09)).

Neighbouring local authorities have not indicated any source of dust emissions which may impact on the Borough.

Ipswich Borough Council confirms that there are no confirmed significant sources of fugitive particulate matter emissions in the Local Authority area. Investigations into dust around the Port of Ipswich area are ongoing.

8 Conclusions and Proposed Actions

8.1 Conclusions from New Monitoring Data

Exceedences in nitrogen dioxide outside existing AQMA's were obtained at one kerbside and one roadside location; St-Matthew's Street and St-Helen's Street respectively. These locations have been monitored since November 2007 and monitoring is to be continued owing to the close proximity of the residential properties.

In both cases, a Detailed Assessment is required with a view to determining whether or not to declare an AQMA at these 2 locations. No further action is required in the other areas (i.e. St-Margaret's Street, Chevalier Street, Star Lane/Fore Street) showing exceedences of the $40 \mu\text{g}/\text{m}^3$ annual mean NO_2 objective as those areas are already monitored as part of the AQMA's in which they are found. The AQMA orders at these locations should therefore remain in place.

Borderline results (greater than $39 \mu\text{g}/\text{m}^3$) outside existing AQMA's were obtained at one kerbside location; Yarmouth Road/Bramford Road. A data capture of 83% was obtained at the Yarmouth Road/Bramford Road diffusion tube location over the January 2008 to December 2008 period. In addition, the tube was installed in November 2007 and previous monitoring data is therefore unavailable. This location has already had a Detailed Assessment carried out, which has concluded that exceedences of the NO_2 objective are expected. Consideration is currently being given to the report and the need to declare an AQMA. It is important therefore that monitoring of nitrogen dioxide at that location is maintained so that further action can be taken if the results exceed the air quality objective.

No further action is required in the other areas (i.e. St Margaret's Street, St Helen's Street/Argyle Street, Star Lane co-location and Fore Street) showing borderline results as those areas are already monitored as part of the AQMA's in which they are found.

Although full sets of data were not available from 2005 to 2008, it can be seen from the charts (Appendix B) that the concentration of nitrogen dioxide at the sites monitored within the Borough is generally falling and is in most cases lower than the concentration obtained in the previous years.

8.2 Conclusions from Assessment of Sources

Ipswich Borough Council has assessed the relevant road and other transport sources and concludes that no source or changes to those sources, other than the St Matthew's Street/Berners Road/Civic Drive junction, necessitates a Detailed Assessment. Modelling of the St Matthew's Street/Berners Road/Civic Drive junction has showed predicted exceedences of the $40 \mu\text{g}/\text{m}^3$ NO_2 annual mean objective at three modelled receptor locations.

An assessment of the relevant industrial installations indicated that no Detailed Assessment of the installations is required.

An assessment of the commercial and domestic sources showed that the biomass combustion plant at Nacton Road, Ipswich would require a Detailed Assessment for particulate matter. Insufficient information was available regarding a 50kW biomass boiler at Christchurch Park, Ipswich, and solid fuel burning within the Borough. These sources will be further assessed as usable information becomes available.

8.3 Proposed Actions

The following diffusion tube locations fail to meet the location criteria specified in TG(09). These are:

Ipswich Borough Council - England

- St Margaret's Green/St Margaret's Street
- Star Lane/St Peter's Street
- Star Lane
- Star Lane Angel Lane
- Star Lane Angel Lane co-location
- Star Lane Angel Lane co-location

The Star Lane/Angel Lane tubes were moved in January 2009 for co-location onto the continuous monitor (as had been the original intention). The other three locations had been chosen within the AQMAs, and were placed for AQMA boundary review purposes (as part of the Further Assessment). Ipswich Borough Council regularly reviews the location of diffusion tubes.

Ipswich Borough Council has assessed the biomass combustion plant at Nacton Road and the Reg Driver Centre, and concluded that it will be necessary to proceed to a Detailed Assessment for particulate matter and nitrogen dioxide.

As mentioned previously, exceedences in nitrogen dioxide were obtained at the monitored locations on St-Matthew's Street and St-Helen's Street. These locations are both outside of the existing AQMAs. These locations have been monitored since November 2007 and monitoring is to continue owing to the close proximity of the residential properties. In both cases, a Detailed Assessment is required with a view to determining whether or not to declare an AQMA. In addition, St-Helen's Street is located in between the 2 AQMA sections which form the St-Margaret's and Star Lane AQMA. The findings of the Detailed Assessment should determine whether the separate sections of the AQMA boundaries should be merged.

The next course of action for Ipswich Borough Council is to submit the 2010 Progress Report and progress to 2010 Detailed Assessment for the pollutants and sites mentioned above.

9 References

Air Quality (England) Regulations 2000 (SI 928)
Air Quality Daughter Directive
Detailed Assessment (April 2004)
Detailed Assessment (December 2009)
Draft Air Quality Action Plan (August 2008)
EMEP/ CORINAIR Guidebook
Environment Act (1995)
Environmental Permitting Regulations (2007)
Further Assessment Report (August 2008)
Ipswich Air Quality Management Order No 1, 2006
Ipswich Air Quality Management Order No 2, 2006
Ipswich Air Quality Management Order No 3, 2006
National Atmospheric Emissions Inventory Database
Progress Report (September 2005)
Progress Report (December 2009)
Stock Condition Survey 2004
Technical Guidance LAQM.TG (03)
Technical Guidance LAQM.TG (09)
The Air Quality (England) (Amendment) Regulations 2002 (SI 3043)
Updating and Screening Assessment (December 2003)
Updating and Screening Assessment (January 2008)

Appendices

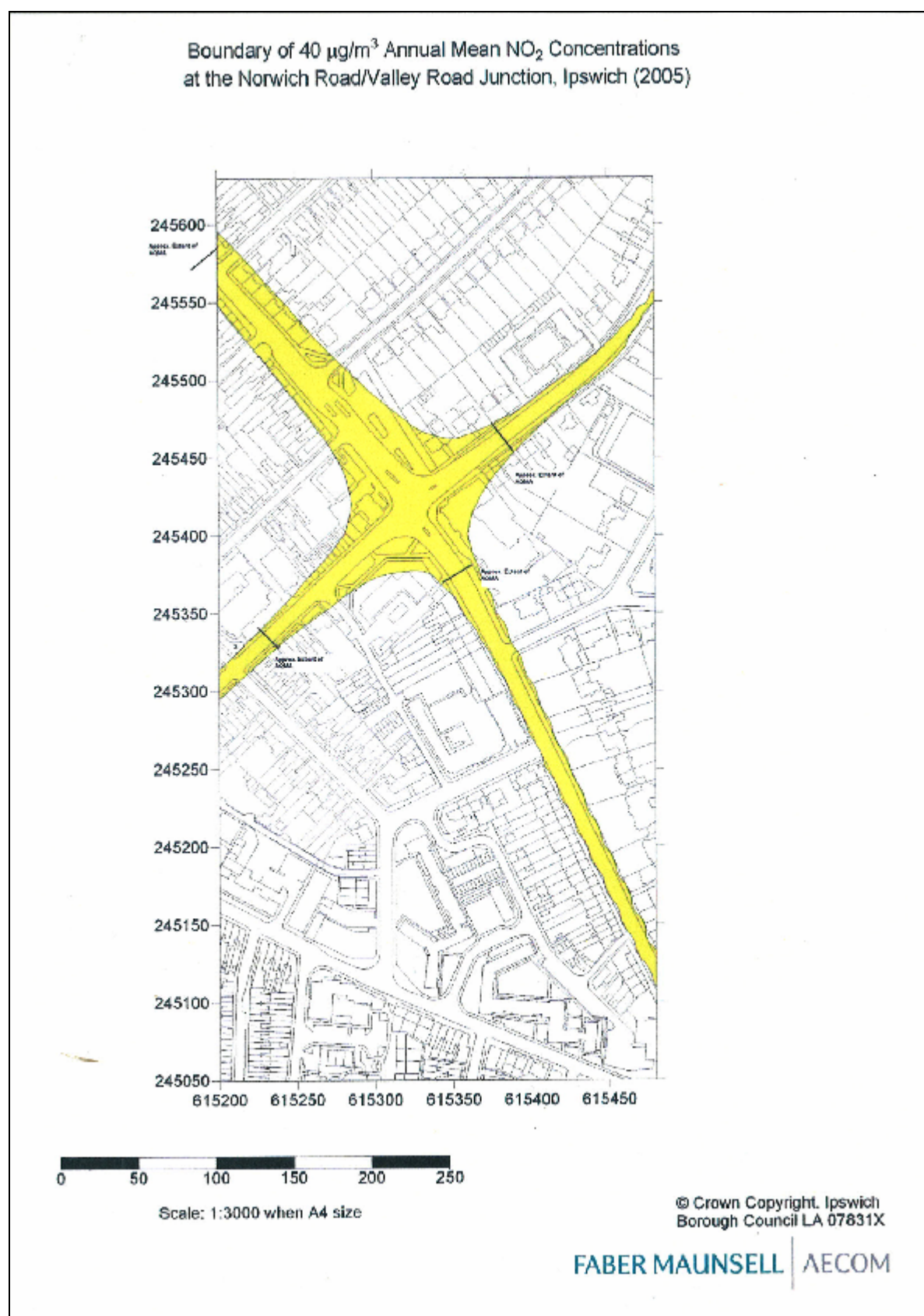
Appendix A: Maps of AQMAs

Appendix B: Location of monitoring sites in Ipswich showing the annual trend in NO₂ levels from 2005-2008.

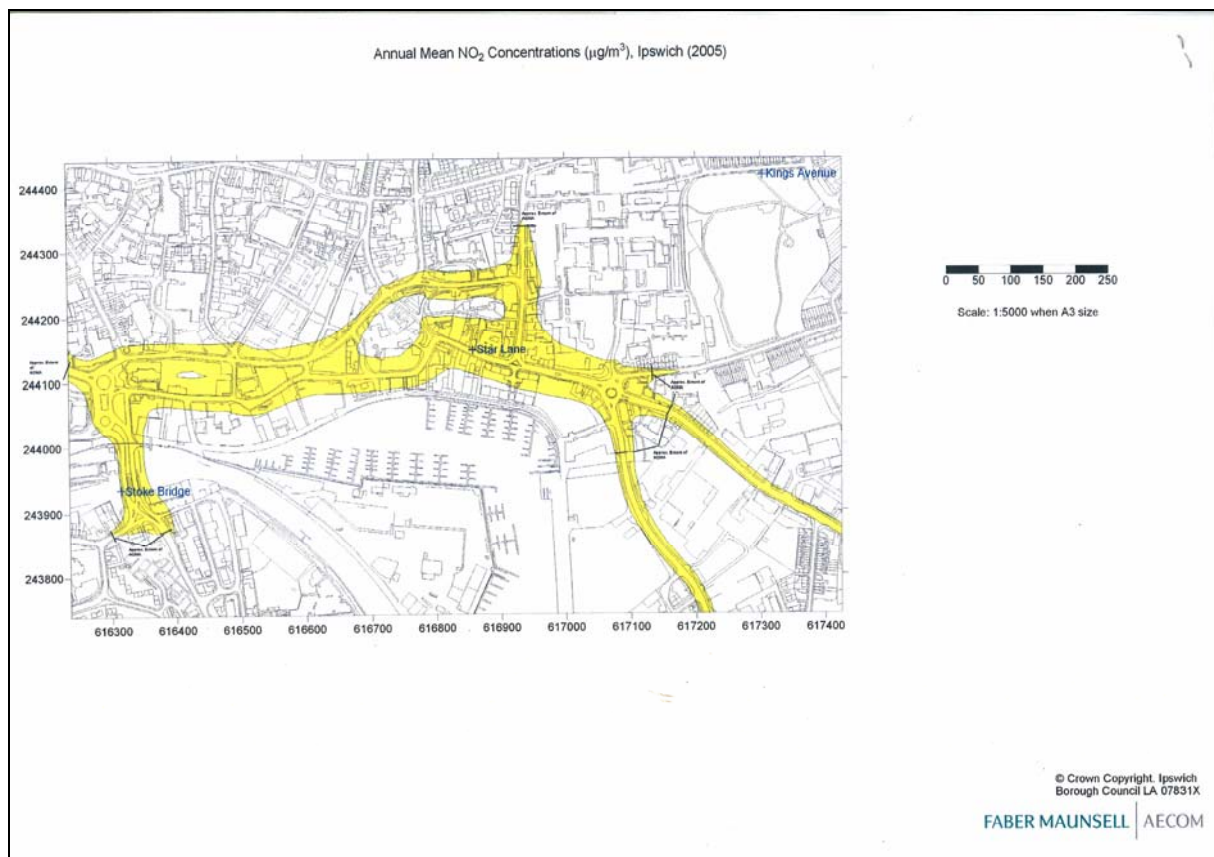
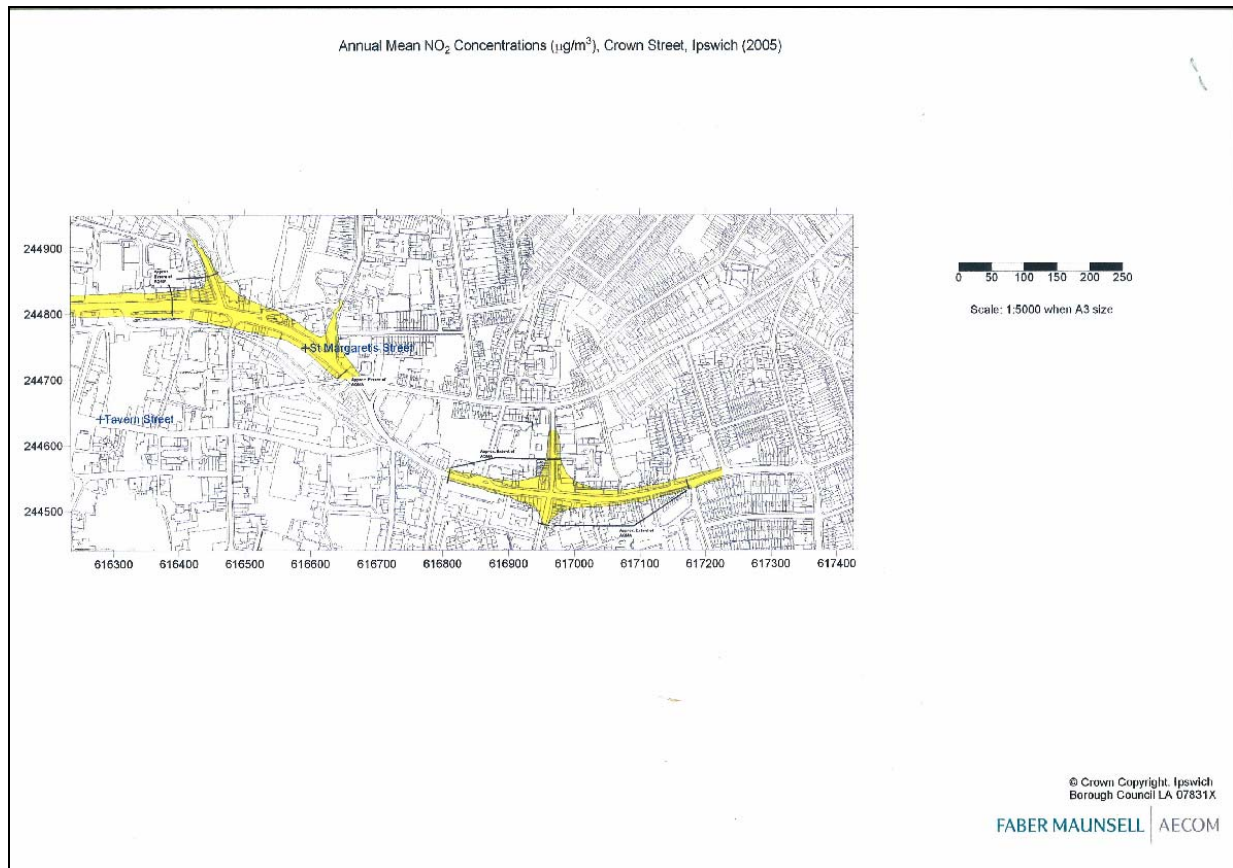
Appendix C: QA/QC Data

Appendix D: DMRB Calculations

Appendix A: Location of AQMAs



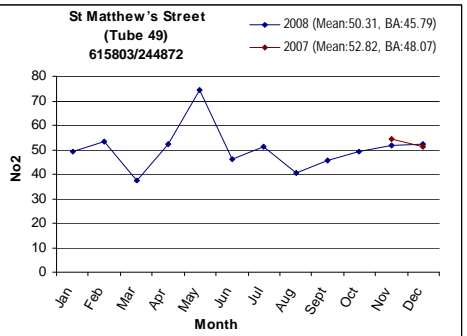
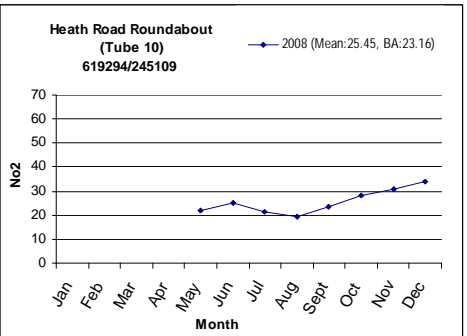
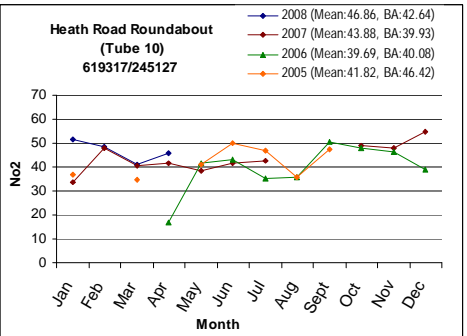
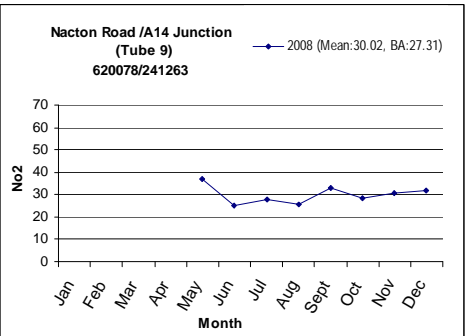
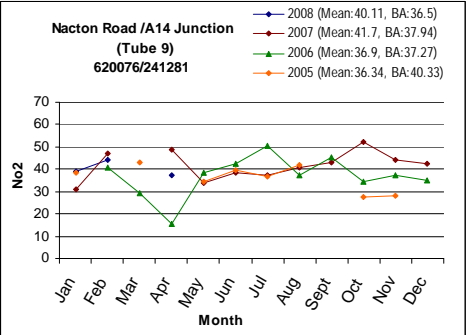
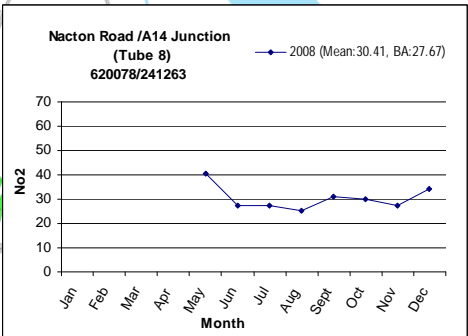
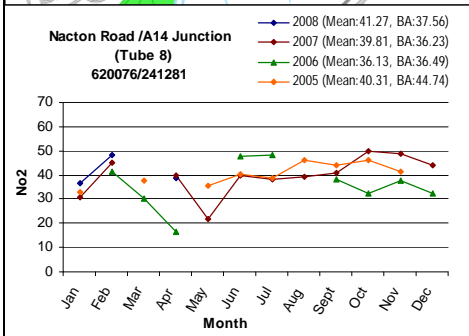
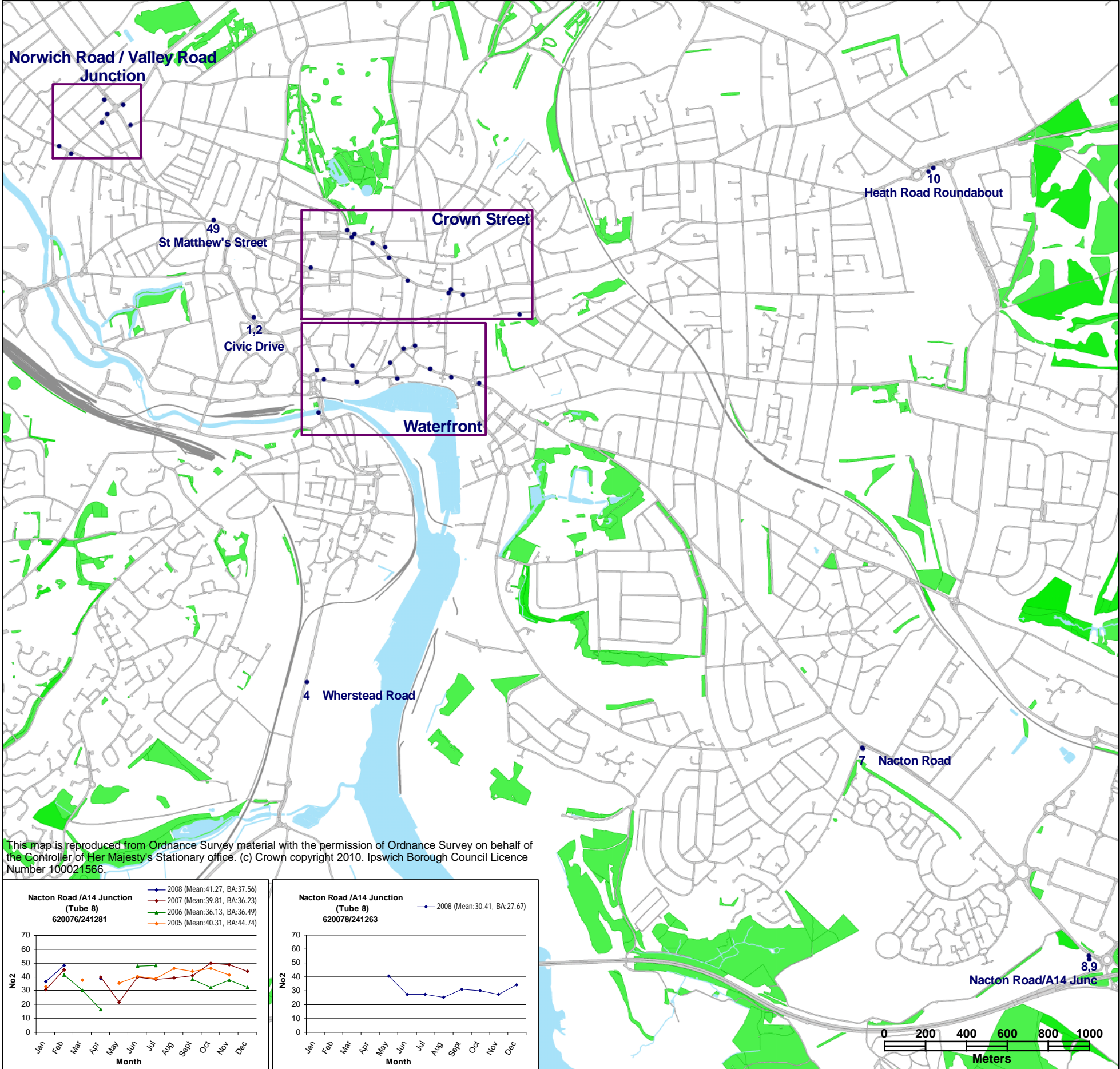
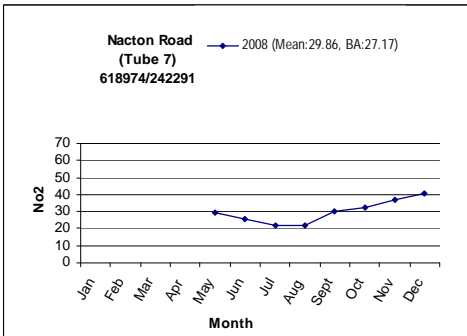
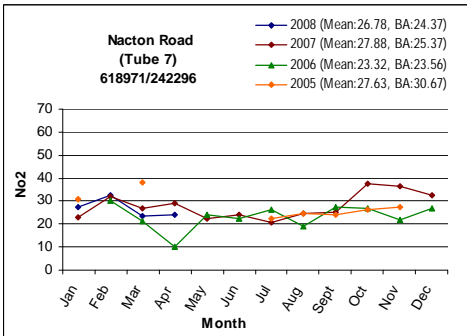
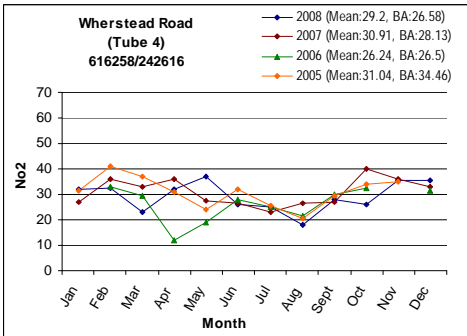
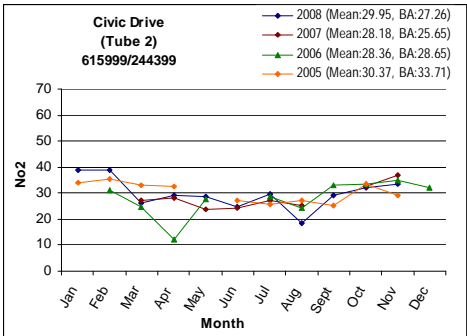
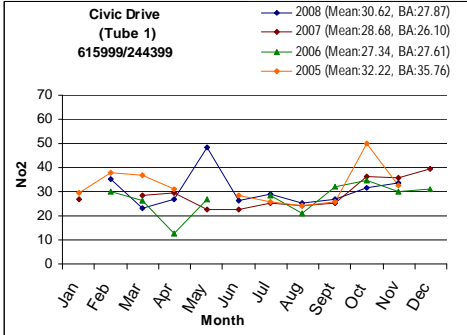
Ipswich Borough Council - England



**Appendix B: Location of monitoring sites in Ipswich
showing the annual trend in NO₂ levels from 2005-2008**

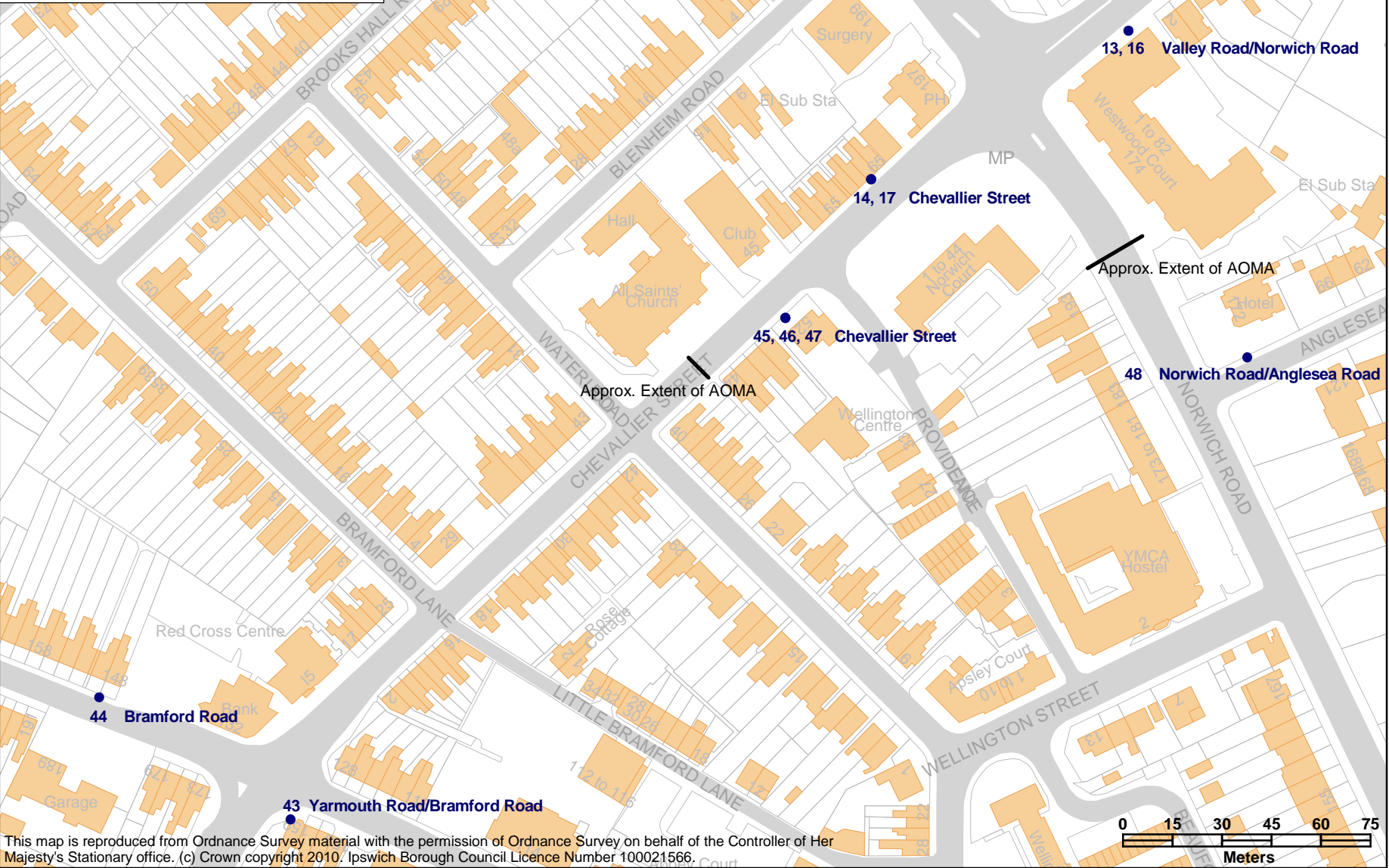
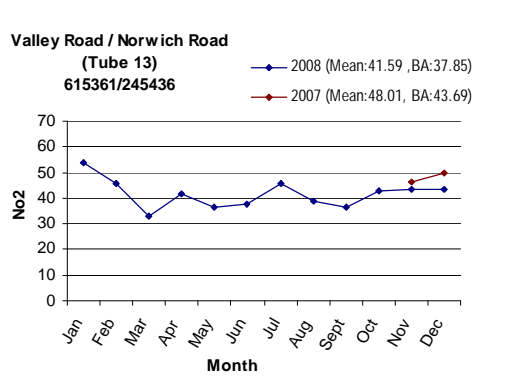
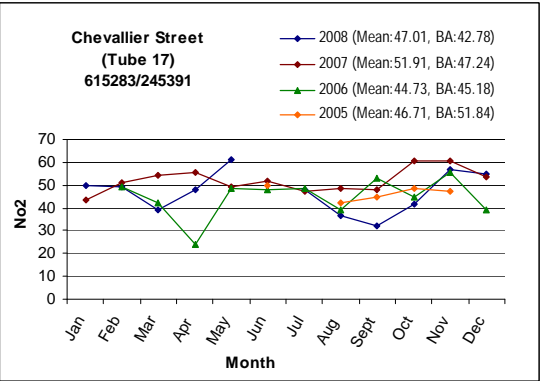
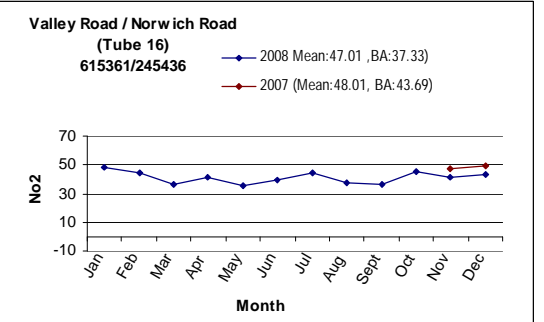
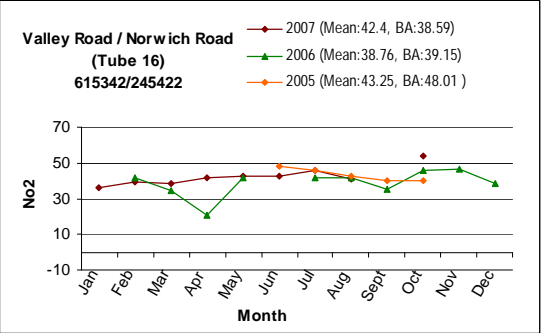
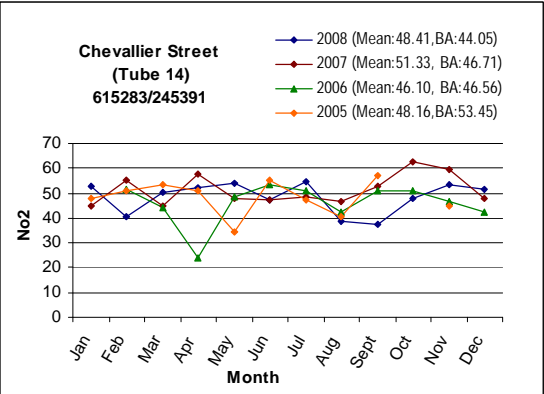
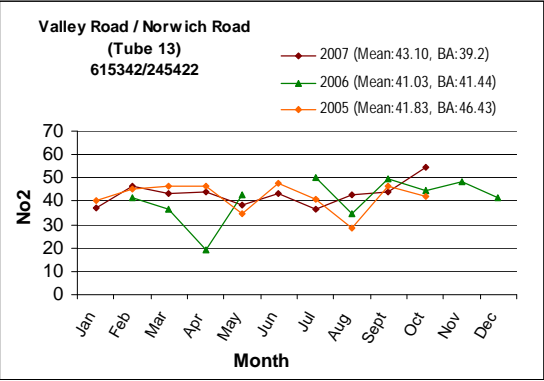
Nitrogen Dioxide Concentrations (ug/m³)

Diffusion Tube Data in Ipswich (2005 - 2008)

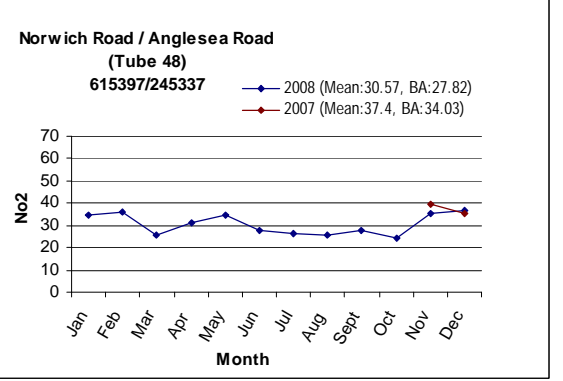
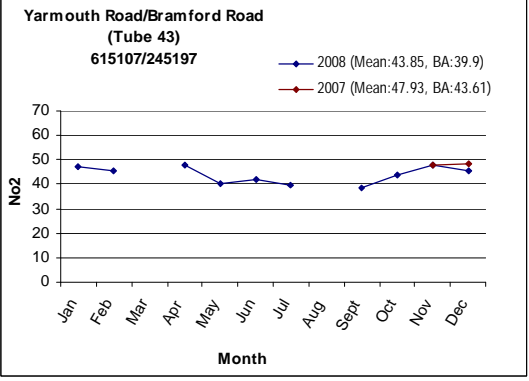
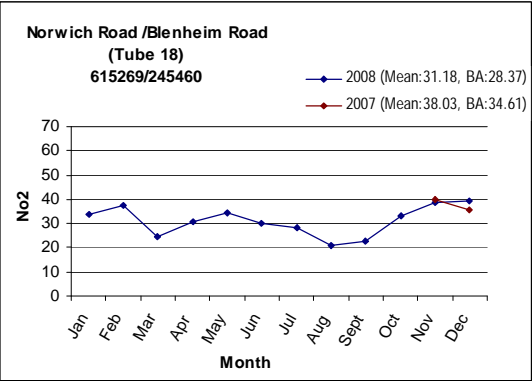
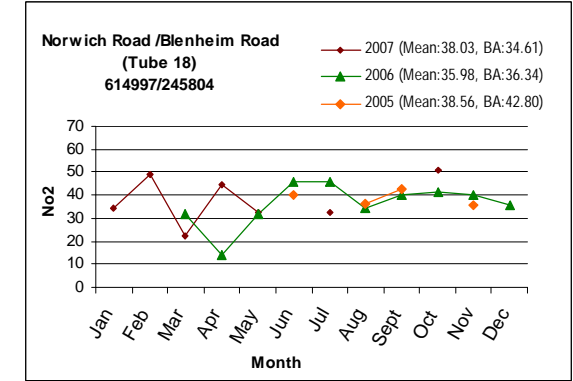
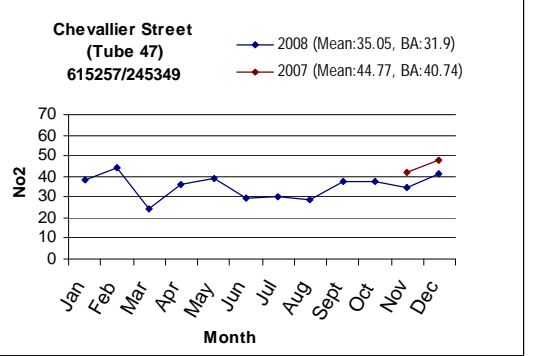
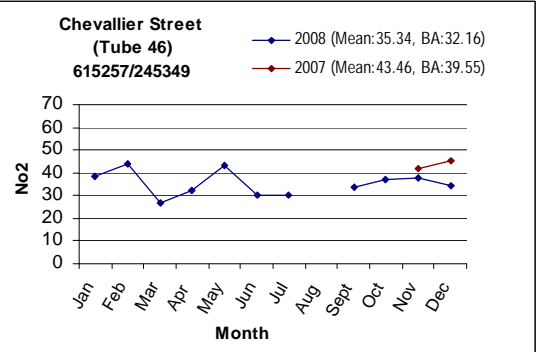
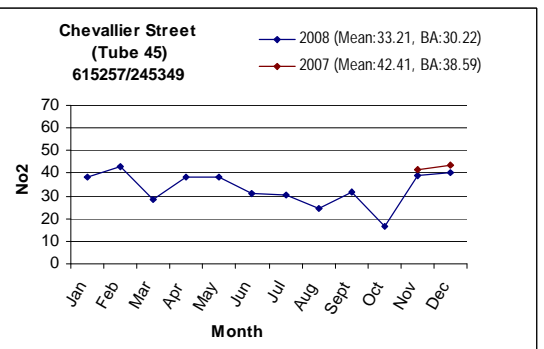
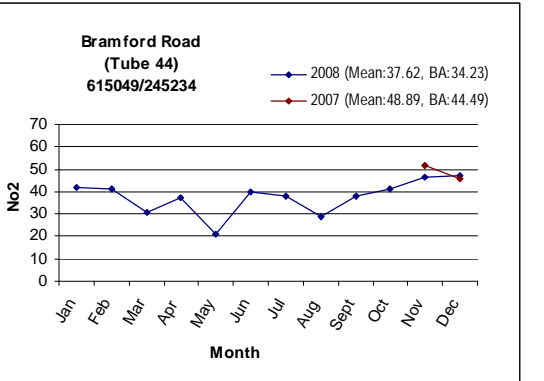


* BA = Bias Adjustment Factor

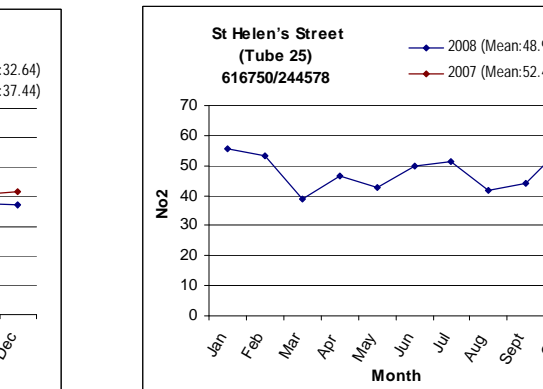
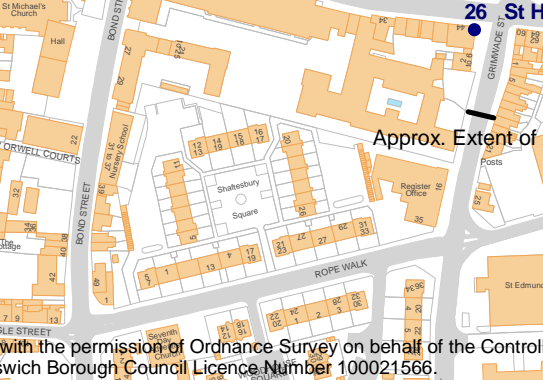
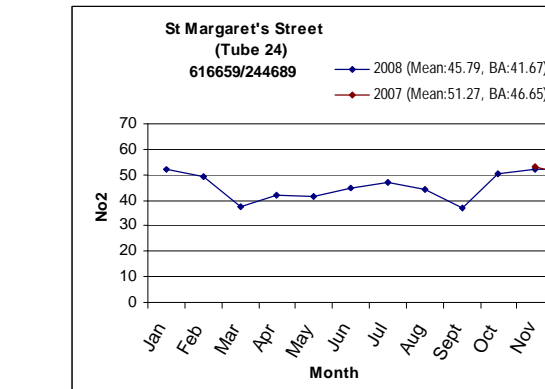
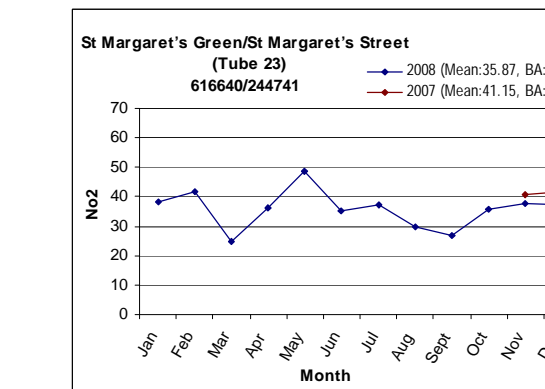
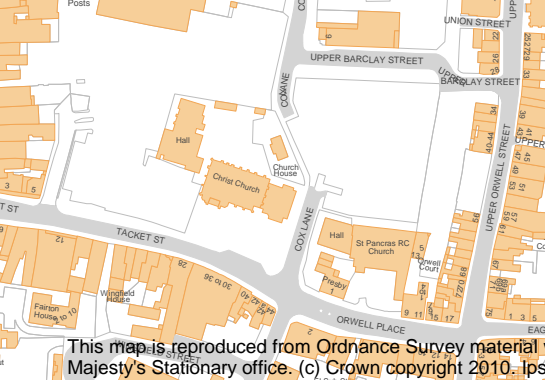
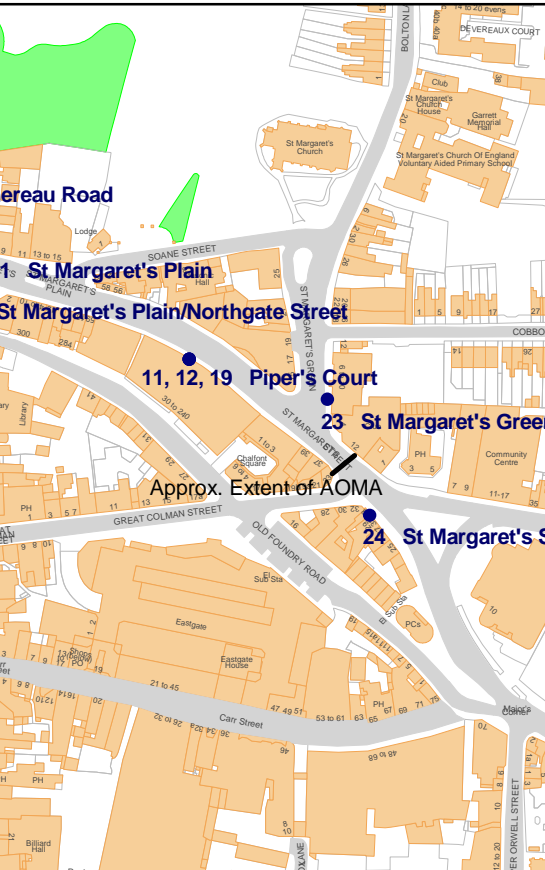
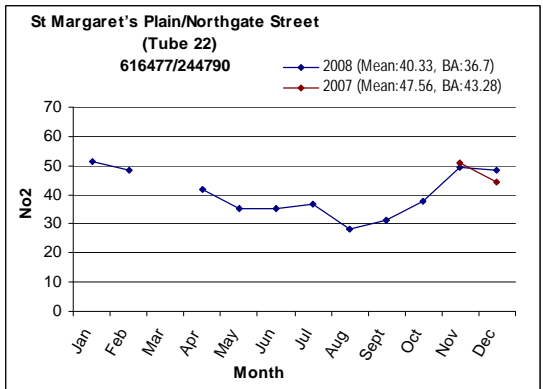
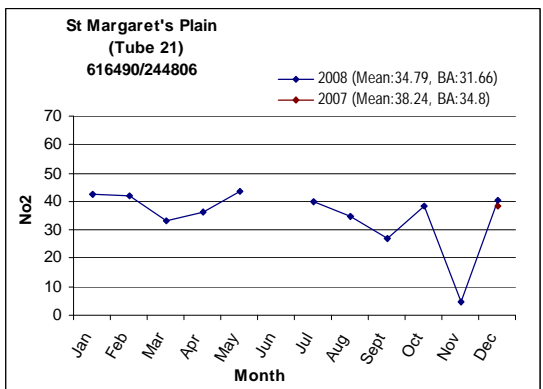
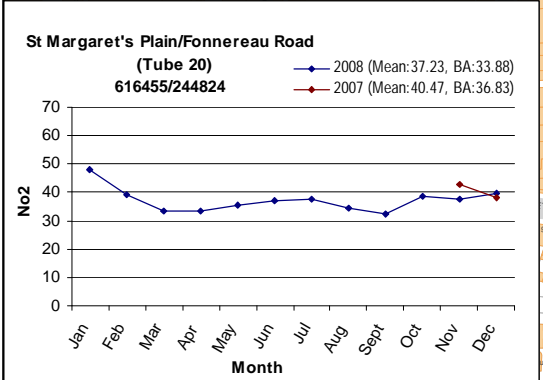
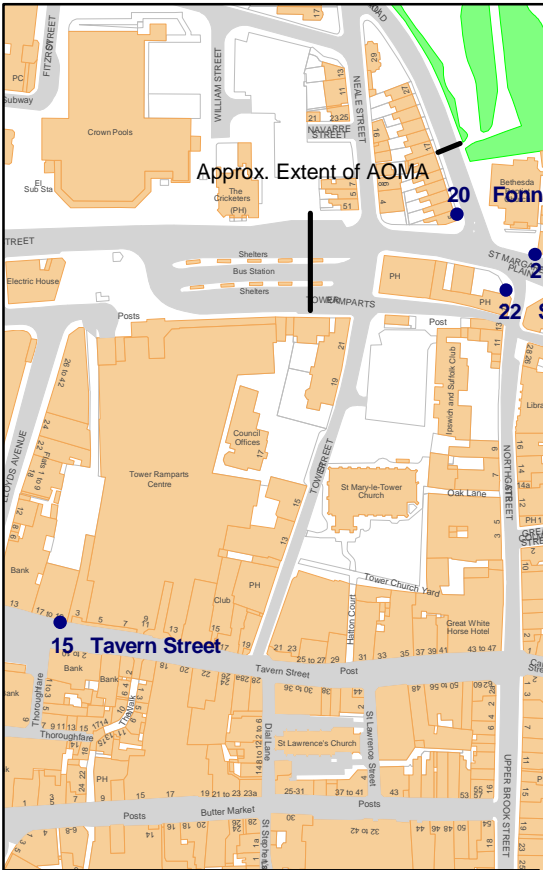
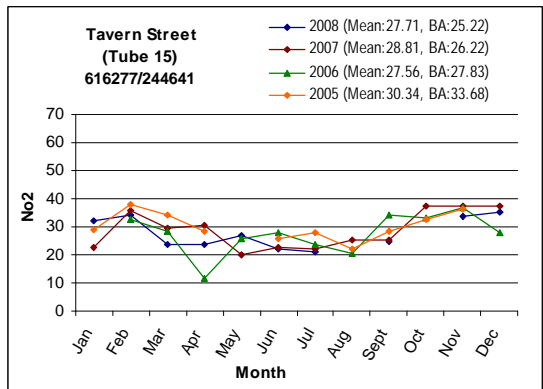
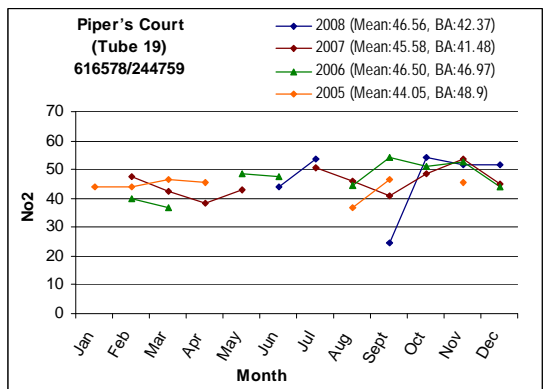
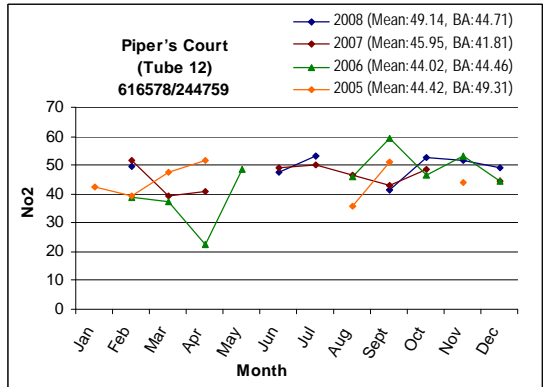
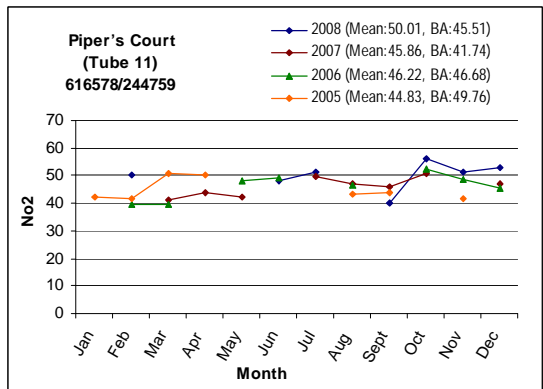
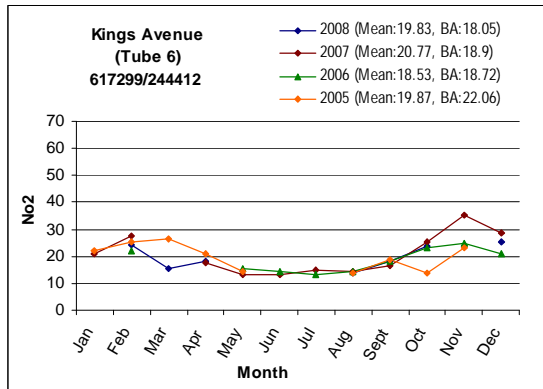
NO2 Concentration (ug/m³) at the Norwich Road / Valley Road Junction, Ipswich (2005-2008)



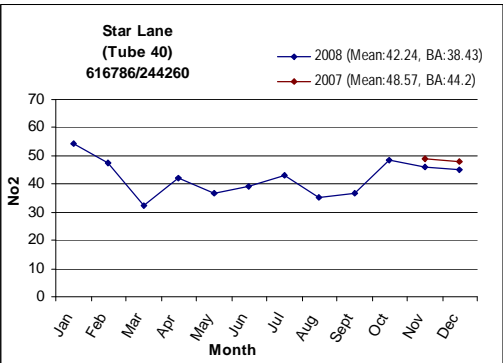
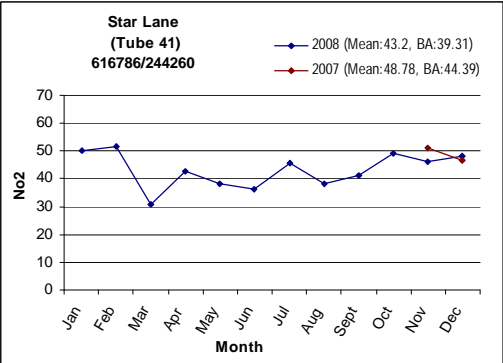
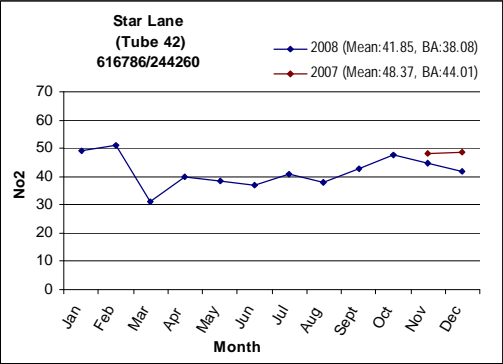
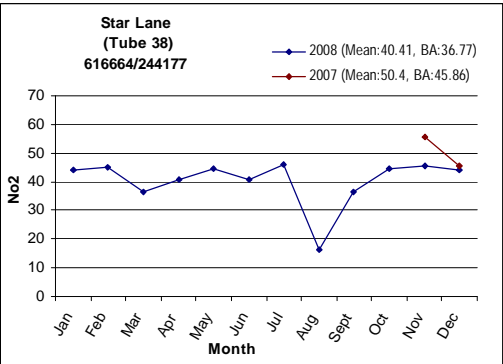
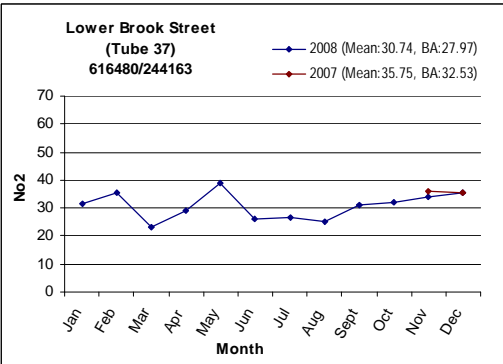
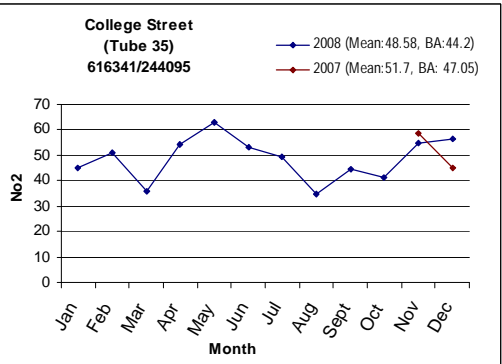
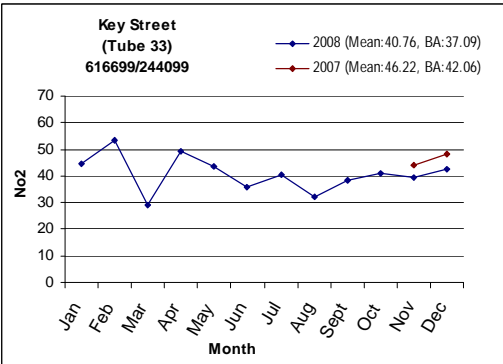
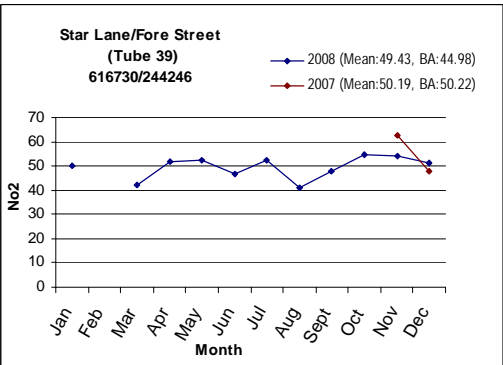
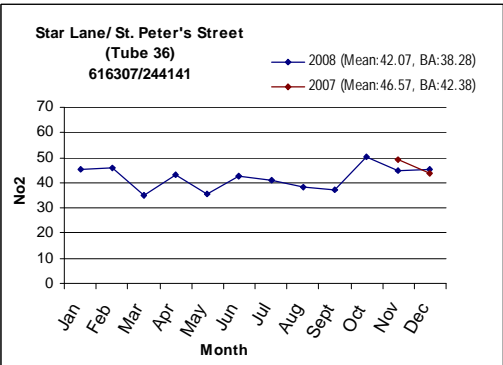
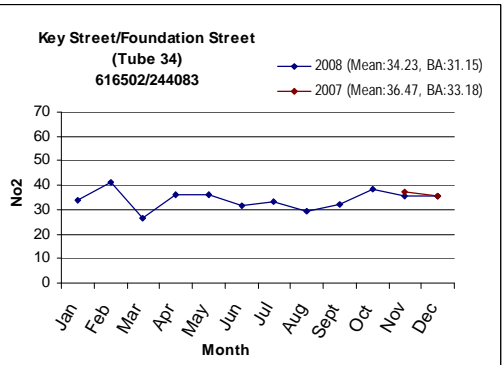
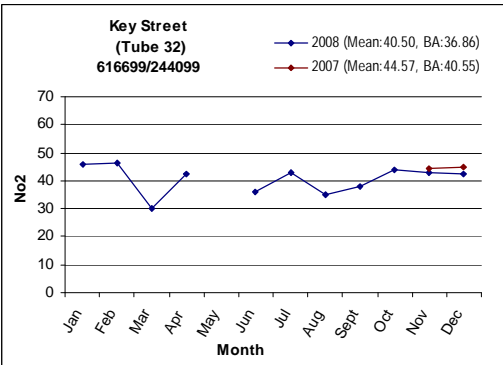
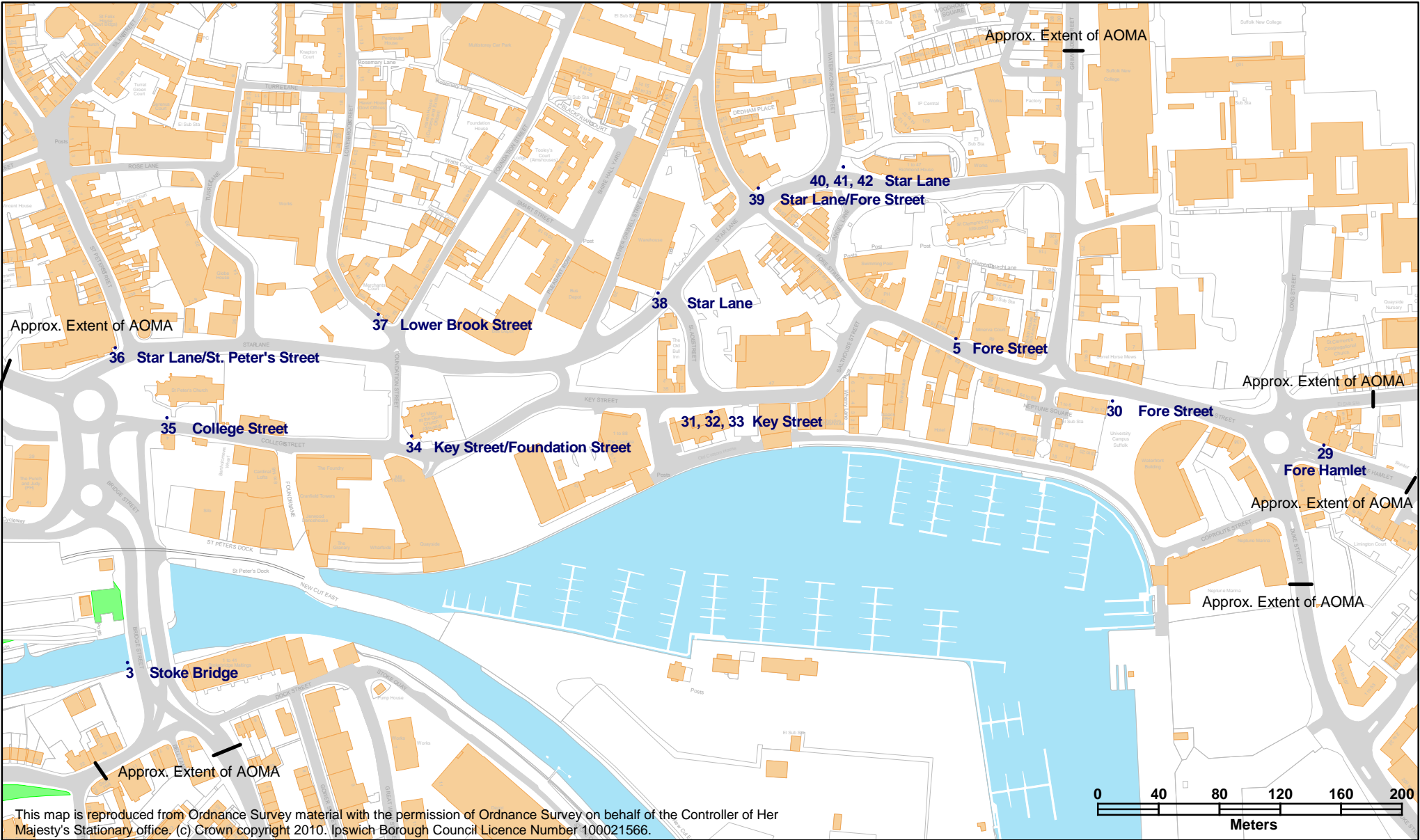
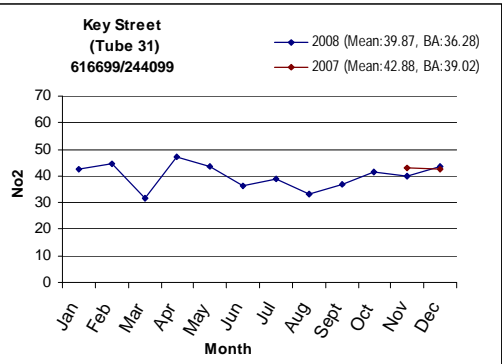
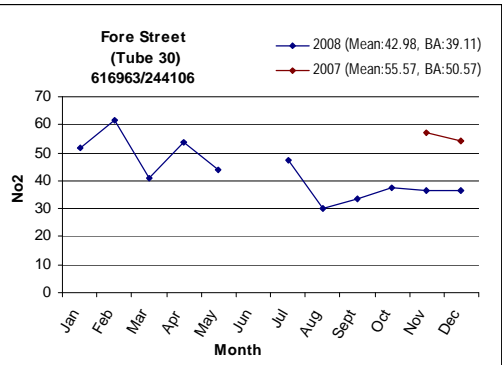
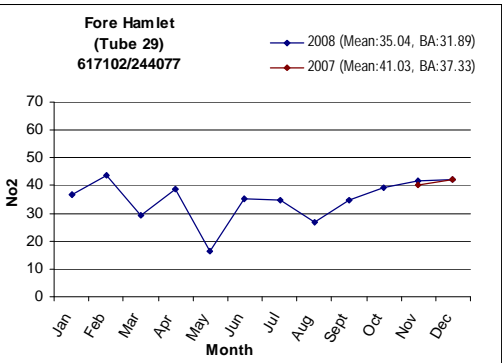
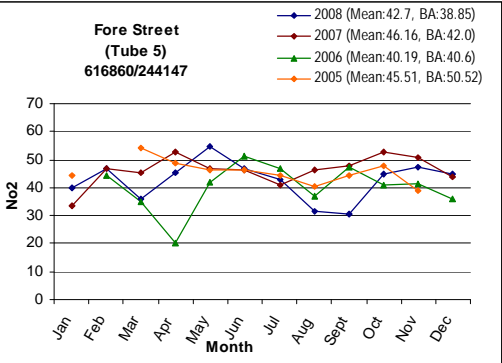
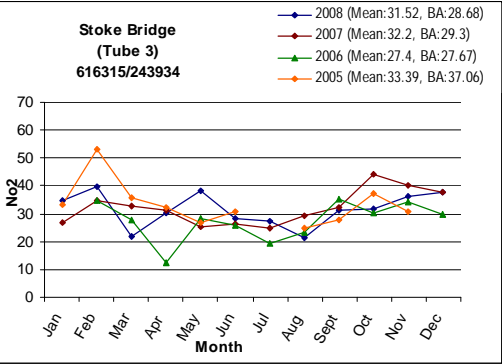
*BA = Bias Adjusment Factor



NO₂ Concentration (ug/m³) Crown Street, Ipswich (2005-2008)



NO₂ Concentration (ug/m³) at the Waterfront, Ipswich (2005-2008)



Appendix C: QA:QC Data

Diffusion Tube Bias Adjustment Factors

The tubes are supplied by Bureau Veritas and analysed by Gradko International Limited, based in Winchester. The WASP results indicated that Gradko achieved a 'Good' rating in 2008.

The preparation up to the end of the 2008 period is 50% TEA in acetone and the method is as described in the Harmonisation Practical Guidance for the laboratory. The laboratory follows all the procedures set out in the Guidance except for the temperature dependent co-efficient.

The bias adjustment factor being applied to the annual means from the diffusion tubes for both 2007 and 2008 is 0.91. This figure was calculated by AEA Energy and Environment using the monthly values collected from the triplicate tubes co-located with the automatic analysers at St Margaret's Street (2007) and Chevallier Street (2008). An 82% (2007) and 93% (2008) data capture was obtained from the automatic monitors at that location.

Local Co-location Studies

Table C.1 below details the local co-location sites:

Location	Within AQMA?	Site type	2007 - annual mean concentrations ($\mu\text{g}/\text{m}^3$)	
			Adjusted for bias #	Adjusted for bias and corrected for fall-out
Civic Drive	N	Urban roadside	26.1	26.1
Civic Drive co-location	N	Urban roadside	25.6	25.6
Nacton Rd/A14 junct*	N	Urban roadside	36.2	29.5
Nacton Rd/A14 junct*	N	Urban roadside	37.9	30.4
St Margaret's Street, Pipers Court	Y	Urban roadside	41.7	40
St Margaret's Street, Pipers Court co-location	Y	Urban roadside	41.8	40.1
St Margaret's Street, Pipers Court co-location	Y	Urban roadside	41.5	39.8
Valley/Norwich Road *	Y	Urban roadside	39.2	35.7
Valley/Norwich Road *	Y	Urban roadside	38.6	35.3
Chevallier Street, Outside number 63	Y	Urban roadside	46.7	46.7
Chevallier Street, outside number 63	Y	Urban roadside	47.2	47.2

The diffusion tubes marked with an * were relocated in November 2007. Results have not been included for the final two months data at the new locations due to the short time period.

Location	Within AQMA?	Site type	2008 - annual mean concentrations ($\mu\text{g}/\text{m}^3$)	
			Adjusted for bias #	Adjusted for bias and corrected for fall-out
Civic Drive	N	Urban roadside	27.9	27.9
Civic Drive co-	N	Urban	27.3	27.3

Ipswich Borough Council - England

location		roadside		
Nacton Rd/A14 junct*	N	Urban roadside	37.6	29.6
Nacton Rd/A14 junct*	N	Urban roadside	36.5	29.0
St Margaret's Street, Pipers Court	Y	Urban roadside	45.5	45.5
St Margaret's Street, Pipers Court co-location	Y	Urban roadside	44.7	44.7
St Margaret's Street, Pipers Court co-location	Y	Urban roadside	42.4	42.4
Valley/Norwich Road	Y	Urban roadside	37.8	34.1
Valley/Norwich Road	Y	Urban roadside	37.3	33.7
Chevallier Street, outside number 63	Y	Urban roadside	44.1	41.9
Chevallier Street, outside number 63	Y	Urban roadside	42.8	42.8
Key Street	Y	Urban roadside	36.3	36.3
Key Street co locate	Y	Urban roadside	36.9	36.9
Key Street co locate	Y	Urban roadside	37.1	37.1
Star Lane, opposite St-Peter's Street	Y	Urban roadside	38.4	38.4
Star Lane, opposite St-Peter's Street co-location	Y	Urban roadside	39.3	39.3
Star Lane, opposite St-Peter's Street co-location	Y	Urban roadside	38.1	38.1
Chevallier Street, Wellington Centre	Y	Urban roadside	30.2	28.9
Chevallier Street, Wellington Centre co-location	Y	Urban roadside	32.2	30.7
Chevallier Street, Wellington Centre co-location	Y	Urban roadside	31.9	30.4

The diffusion tubes marked with an * were relocated in May 2008 to the locations outlined below:

Nacton Rd/A14 junct	N	Urban roadside	27.7	27.0
Nacton Rd/A14 junct	N	Urban roadside	27.3	26.3

Discussion of Choice of Factor to Use

Ipswich Borough Council - England

The bias adjustment factor being applied to the annual means from the diffusion tubes is 0.91. This figure was calculated by AEA Energy and Environment using the monthly values collected from the triplicate tubes co-located with the automatic analysers at Chevallier Street. A 93% data capture was obtained from the automatic monitors at that location whereas an 57.5% data capture was obtained at Piper's Court which was deemed insufficient to enable the derivation of a bias adjustment factor.

Short-term to Long-term Data adjustment

No short-term to long-term data adjustment was undertaken as all monitoring periods were greater than 3 months.

QA/QC of automatic monitoring

The automatic monitors are routinely calibrated once every 2 weeks by an Environment Protection Officer and serviced once a year by the manufacturers. All data collected from the automatic monitors are managed by external consultants (AEA) to quality procedures developed under the UK National Network. The data management processes represent best practice and fully meet the requirements set out in LAQM TG(09).

All data are screened and scaled (on the basis of site calibrations) and the final data sets presented within this report have benefited from a full process of data ratification, including through additional data quality checks that include site UKAS quality control audits and a final data ratification process that corrects data for instrument sensitivity drift between routine calibrations

QA/QC of diffusion tube monitoring

The tubes are supplied by Bureau Veritas and analysed by Gradko International Limited, based in Winchester. The WASP results indicated that Gradko achieved a 'Good' rating in 2008.

Appendix D: DMRB Calculations

Table D.1 : DMRB calculations at junctions showing modelled NO₂ and PM₁₀ results.

Bixley Road/ Foxhall Road/Heath Road Junction																
No.	Receptor	Grid Reference	Distance (m)	AADT	Speed (km/hr)	Road type	% LDV	% HDV	Measured Background NO2(ug/m3)	Defra Background NO2(ug/m3)	Background NO2 used(ug/m3)	Modelled NO2 annual mean(ug/m3)	Defra background PM10 used (ug/m3)	Modelled PM10 annual mean (ug/m3)	Modelled no. of days PM10> 50ug/m3	
1	2 Bixley Road	TM1957243972	8.2	24075	15 B		96.9	3.1	21.6307	18.195	19.91285					
2	2 Bixley Road	TM1957243972	18	13484	12 B		96.7	3.3	21.6307	18.195	19.91285	30.40		18.79482	24.10	10
2	6 Bixley Road	TM1955743921	19.9	24075	20 B		96.9	3.1	21.6307	18.195	19.91285			18.79482		
6	6 Bixley Road	TM1955743921	77.8	13484	12 B		96.7	3.3	21.6307	18.195	19.91285	26.00		18.79482	21.40	5
3	628 Foxhall Road	TM1955243987	17.1	13484	15 B		96.7	3.3	21.6307	18.195	19.91285			18.79482		
628	628 Foxhall Road	TM1955243987	24.8	24075	12 B		96.9	3.1	21.6307	18.195	19.91285	28.60		18.79482	23.00	8
4	609 Foxhall Road	TM1951744040	18.3	13484	20 B		96.7	3.3	21.6307	17.81229	19.721495			18.83386		
609	609 Foxhall Road	TM1951744040	70	22207	12 B		96.3	3.7	21.6307	17.81229	19.721495	25.50		18.83386	21.30	5
5	1 Heath Road	TM1957144029	18.1	22207	12 B		96.3	3.7	21.6307	17.81229	19.721495			18.83386		
1	1 Heath Road	TM1957144029	19.8	13484	12 B		96.7	3.3	21.6307	17.81229	19.721495	29.40		18.83386	23.50	9
6	6 Heath Road	TM1962144029	19.8	22207	12 B		96.3	3.7	21.6307	17.81229	19.721495			18.83386		
6	6 Heath Road	TM1962144029	28.9	12812	12 B		97.1	2.9	21.6307	17.81229	19.721495	28.30		18.83386	22.90	8
7	631 Foxhall Road	TM1964844007	16.5	12812	15 B		97.1	2.9	21.6307	17.81229	19.721495			18.83386		
631	631 Foxhall Road	TM1964844007	53.1	22207	12 B		96.3	3.7	21.6307	17.81229	19.721495	26.40		18.83386	21.80	6
8	630 Foxhall Road	TM1961443969	16.9	12812	12 B		97.1	2.9	21.6307	18.195	19.91285			18.79482		
630	630 Foxhall Road	TM1961443969	19	24075	12 B		96.9	3.1	21.6307	18.195	19.91285	29.10		18.79482	23.40	9
Nacton Road/ Landseer Road/ Rands Way Junction																
No.	Receptor	Grid Reference	Distance (m)	AADT	Speed (km/hr)	Road type	% LDV	% HDV	Measured Background NO2(ug/m3)	Defra Background NO2(ug/m3)	Background NO2 used(ug/m3)	Modelled NO2 annual mean(ug/m3)	Defra background PM10 used (ug/m3)	Modelled PM10 annual mean (ug/m3)	Modelled no. of days PM10>50 ug/m3	
1	484 Landseer Road	TM1881142446	12.4	18360	20 B		90.2	9.8	21.6307	18.85306	20.24188			18.90082		
	484 Landseer Road	TM1881142446	32.9	11267	20 B		90.2	9.8	21.6307	18.85306	20.24188			18.90082		
	484 Landseer Road	TM1881142446	36.1	3479	20 B		95.6	4.4	21.6307	18.85306	20.24188	32.50		18.90082	24.10	10
2	473 Nacton Road	TM1887442431	15.6	18360	20 B		90.2	9.8	21.6307	18.85306	20.24188			18.90082		
473	Nacton Road	TM1887442431	87.7	11267	20 B		90.2	9.8	21.6307	18.85306	20.24188			18.90082		
473	Nacton Road	TM1887442431	79.6	3479	20 B		95.6	4.4	21.6307	18.85306	20.24188	29.70		18.90082	22.60	7
3	447 Landseer Road	TM1876742469	44.5	3479	20 B		95.6	4.4	21.6307	18.85306	20.24188			18.90082		
447	Landseer Road	TM1876742469	27.1	11267	20 B		90.2	9.8	21.6307	18.85306	20.24188			18.90082		
447	Landseer Road	TM1876742469	41.4	18360	20 B		90.2	9.8	21.6307	18.85306	20.24188	29.30		18.90082	22.40	7
4	392 Nacton Road	TM1877042502	34.8	11267	20 B		90.2	9.8	21.6307	18.85306	20.24188			18.90082		
392	Nacton Road	TM1877042502	40.8	3479	20 B		95.6	4.4	21.6307	18.85306	20.24188			18.90082		
392	Nacton Road	TM1877042502	44.5	18360	20 B		90.2	9.8	21.6307	18.85306	20.24188	28.50		18.90082	22.00	6
5	77 Rands Way	TM1883942494	12	3479	20 B		95.6	4.4	21.6307	18.85306	20.24188			18.90082		
77	Rands Way	TM1883942494	31.5	18360	20 B		90.2	9.8	21.6307	18.85306	20.24188			18.90082		
77	Rands Way	TM1883942494	37.4	11267	20 B		90.2	9.8	21.6307	18.85306	20.24188	30.00		18.90082	22.80	8
Civic Drive/ Princes St/ Franciscan Way junction																
No.	Receptor	Grid Reference	Distance (m)	AADT	Speed (km/hr)	Road type	% LDV	% HDV	Measured Background NO2(ug/m3)	Defra Background NO2(ug/m3)	Background NO2 used(ug/m3)	Modelled NO2 annual mean(ug/m3)	Defra background PM10 used (ug/m3)	Modelled PM10 annual mean (ug/m3)	Modelled no. of days PM10>50 ug/m3	
	Flat 1, 25 Franciscan Way	TM1612544297	6	12138	25 B		97.6	2.4	21.6307	23.73383	22.682265			19.96605		
	Flat 1, 25 Franciscan Way	TM1612544297	91	7201	20 B		97	3	21.6307	23.73383	22.682265	27.40		19.96605	21.90	6
	Franciscan House, 51 Princes St	TM1599044316	8.8	7643	20 B		97.4	2.6	21.6307	23.13528	22.38299			19.78682		
	Franciscan House, 51 Princes St	TM1599044316	26.2	14102	20 B		97.7	2.4	21.6307	23.13528	22.38299	28.10		19.78682	22.30	7
	1 Observation Court, 84 Princes Street	TM1599744353	11.2	7643	20 B		97.4	2.6	21.6307	23.13528	22.38299			19.78682		
	1 Observation Court, 84 Princes Street	TM1599744353	7	14102	20 B		97.7	2.4	21.6307	23.13528	22.38299	29.50		19.78682	23.10	8
4	38 Princes Street	TM1608244408	4.9	16066	25 B		96.6	3.4	21.6307	23.73383	22.682265			19.96605		
38	Princes Street	TM1608244408	51.6	14102	20 B		97.7	2.4	21.6307	23.73383	22.682265	29.90		19.96605	23.10	8
St Matthew's Street/ Berners Road/ Civic Drive Junction																
No.	Receptor	Grid Reference	Distance (m)	AADT	Speed (km/hr)	Road type	% LDV	% HDV	Measured Background NO2(ug/m3)	Defra Background NO2(ug/m3)	Background NO2 used(ug/m3)	Modelled NO2 annual mean(ug/m3)	Defra background PM10 used (ug/m3)	Modelled PM10 annual mean (ug/m3)	Modelled no. of days PM10>50 ug/m3	
1	26 St Matthews St	TM1593144846	15.9	14939	20 B		97.6	2.4	21.6307	23.13528	22.38299			19.78682		
26	St Matthews St	TM1593144846	16	10716	20 B		99.4	0.6	21.6307	23.13528	22.38299			19.78682		
26	St Matthews St	TM1593144846	47.6	25726	20 B		98.1	1.9	21.6307	23.13528	22.38299	30.29		19.78682	23.72	10
2	36 St Matthews St	TM1589244870	18.3	10647	20 B		99.4	0.6	21.6307	23.13528	22.38299			19.78682		
36	St Matthews St	TM1589244870	17	14939	20 B		97.6	2.4	21.6307	23.13528	22.38299			19.78682		
36	St Matthews St	TM1589244870	49.6	25726	20 B		98.1	1.9	21.6307	23.13528	22.38299	30.00		19.78682	23.50	9
3	23 St Matthews St	TM1592944791	19	25726	20 B		98.1	1.9	21.6307	23.13528	22.38299			19.78682		
23	St Matthews St	TM1592944792	15.2	14939	20 B		97.6	2.4	21.6307	23.13528	22.38299			19.78682		
23	St Matthews St	TM1592944793	43.4	10716	20 B		99.4	0.6	21.6307	23.13528	22.38299	31.20		19.78682	24.20	11
4	34 St Matthews St	TM1590144870	4.5	10716	20 B		99.4	0.6	21.6307	23.13528	22.38299			19.78682		
34	St Matthews St	TM1590144870	20.3	14939	20 B		97.6	2.4	21.6307	23.13528	22.38299			19.78682		
34	St Matthews St	TM1590144870	54	25726	20 B		98.1	1.9	21.6307	23.13528	22.38299	30.20		19.78682	23.70	10

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Verification

The DMRB model was verified according to the guidance in TG (09) following the example provided in Example 2. Diffusion tubes were used to adjust the nitrogen oxides road contribution. Advice obtained from the Bureau Veritas Helpdesk was to consider only modelled NO₂ values greater than 30µg/m³. These values are highlighted in red in the table above. The corresponding 5 receptor locations were selected in order to determine whether model verification was required on any of these locations. This assessment is shown in the table below:

Table D.2: Determination of receptor locations requiring model verification

Side ID	Monitor Type	Site description	Receptor Location	Background NO ₂	Monitored total NO ₂	Modelled total NO ₂	% Difference
1	Diffusion tube	Urban B road	2 Bixley Road	18.195	29.3	30.4	+3.8
2	Diffusion tube	Urban B road	484 Landseer Road	18.85306	24.9	32.5	+30.5
3	Diffusion tube	Urban B road	23 St Matthew's Street	23.13528	45.8	31.2	-31.9
4	Diffusion tube	Urban B road	26 St Matthew's Street	23.13528	45.8	30.29	-33.9
5	Diffusion tube	Urban B road	34 St Matthew's Street	23.13528	45.8	30.2	-34.1

The background values were obtained using the data supplied by UK Air Quality Archive.

484 Landseer Road, 23 St Matthew's Street, 26 St Matthew's Street and 34 St Matthew's Street required further verification as the % difference at these locations was greater than 25%.

Table D.3a :Model verification calculations

Receptor Location	Monitored total NO ₂	Monitored total NO _x	B/G NO ₂	B/G NO _x	Monitored road contribution on NO ₂	Monitored road contribution NO _x	Modelled road contribution NO _x
484 Landseer Road	24.9	47	18.85	25.63	6.05	25.6	14.12
23 St Matthew's Street	45.8	62.8	23.14	33.36	22.66	29.4	68.75
26 St Matthew's Street	45.8	62.8	23.14	33.36	22.66	29.4	68.75
34 St Matthew's Street	45.8	62.8	23.14	33.36	22.66	29.4	68.75

B/G: Background

Table D.3b :Model verification calculations

Receptor Location	Ratio	Adjustment factor	Adjusted modelled road contribution NO _x	Adjusted modelled total NO _x	Modelled total NO ₂	Monitored total NO ₂	% difference
484	1.81	1.12	15.8	41.43	25.58	24.9	+2.7

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Landseer Road							
23 St Matthew's Street	0.43	1.12	77	110.36	47.76	45.8	+4.3
26 St Matthew's Street	0.43	1.12	77	110.36	47.76	45.8	+4.3
34 St Matthew's Street	0.43	1.12	77	110.36	47.76	45.8	+4.3

A comparison of the adjusted modelled total NO₂ and the monitored total NO₂ shows that the adjusted model is performing well at all locations as the difference is less than 10%.

Plan of St-Matthew's Street/Berners Road/Civic Drive junction

The results of the modelling show that there is an exceedence of the $40 \mu\text{g}/\text{m}^3$ annual mean for NO_2 at the 3 receptor locations modelled on St-Matthew's Street/Berners Road/Civic Drive junction. The site plan overleaf shows the modelled junction including the receptor points at 23, 26 and 34 St Matthew's Street.