NORWICH
City Council

ENVIRONMENT ACT 1995 PART IV

LOCAL AIR QUALITY MANAGEMENT

Air Quality Review and Assessment
Annual Progress Report 2005

City of Norwich

MG Stephenson
Environmental Health Manager
Norwich City Council

Executive Summary

The statutory review and assessment of air quality in Norwich was carried out in four stages to determine whether the national air quality objectives would be met by the end of 2005. The results of these assessments indicated that there are areas of Norwich almost certain to exceed the annual mean objective for Nitrogen Dioxide (NO_2). Consequently, Norwich City Council declared three Air Quality Management Areas (AQMA's) on 1st June 2003 for NO_2 exceedance at St Augustines Street, Grapes Hill and the Castle area of Norwich. The location and extent of these three areas is shown in Appendix 1.

In conjunction with AEA Technology, the Updating and Screening Assessment (USA) of local air quality for Norwich was produced in January 2004. This reviews the previous assessments undertaken for all pollutants identified in the Air Quality Regulations.

Where a significant risk of exceedence is identified for a pollutant, the local authority has to proceed to a Detailed Assessment. However, the updating and screening assessment concluded that Norwich did not require a detailed assessment for NO_2, PM_{10}, Benzene, Carbon Monoxide, Lead, 1-3 Butadiene or Sulphur Dioxide.

In March 2004 Norwich City Council produced an Air Quality Action Plan, which considers a range of strategy options to address poor air quality, together with the feasibility of these options. This, and other air quality documents are on the Norwich City Council website at www.norwich.gov.uk

Air quality continues to be monitored in areas of Norwich in order to identify trends in pollution levels, and to assess progress towards achieving the annual average NO_2 objective in the three AQMA's.

Introduction

The UK Government published it's policy framework for air quality management in 1995, establishing national strategies and policies on air quality, which culminated in the Environment Act 1995. Air quality standards and objectives were identified and enacted through the Air Quality Regulations in 1997, 2000 and 2002.

The air quality objectives set out in the Air Quality Regulations provide the statutory basis for the system of Local Air Quality Management (LAQM). The standards and objectives are shown in the following tables.

The Environment Act 1995 requires Local Authorities to undertake air quality reviews in their respective areas. In areas where an air quality objective is not anticipated to be met, Local Authorities are required to declare Air Quality Management Areas (AQMA's) and implement action plans to improve air quality.

Pollutant	Objective	Measured as	To be achieved by
Benzene	16.25 µg/m^3	Running Annual Mean	31/12/2003
	5 µg/m^3	Annual Mean	31/12/2010
1,3-Butadiene	2.25 µg/m^3	Running Annual Mean	31/12/2003
Carbon monoxide	10.0 mg/m^3	Maximum daily running 8 Hour Mean	31/12/2003
Lead	0.5 µg/m^3	Annual Mean	31/12/2004
	0.25 µg/m^3		31/12/2008
Nitrogen dioxide	200 µg/m^3 Not to be exceeded more than 18 times per year	1 Hour Mean	31/12/2005
	40 µg/m^3	Annual Mean	31/12/2005
Particles (PM_{10}) (gravimetric)	50 µg/m^3 Not to be exceeded more than 35 times per year	24 Hour Mean	31/12/2004
	40 µg/m^3	Annual Mean	31/12/2004
Sulphur dioxide	266 µg/m^3 Not to be exceeded more than 35 times per year	15 Minute Mean	31/12/2005
	350 µg/m^3 Not to be exceeded more than 24 times per year	1 Hour Mean	31/12/2004
	125 µg/m^3 Not to be exceeded more than 3 times per year	24 Hour Mean	31/12/2004

Air Pollution Bandings and Index and the Impact on the Health of People who are Sensitive to Air Pollution

Banding	Index	Health Descriptor
Low	**1**	Effects are unlikely to be noticed even by individuals who know they are sensitive to air pollutants
	2	
	3	
Moderate	**4**	Mild effects, unlikely to require action, may be noticed amongst sensitive individuals.
	5	
	6	
High	**7**	Significant effects may be noticed by sensitive individuals and action to avoid or reduce these effects may be needed (e.g. reducing exposure by spending less time in polluted areas outdoors). Asthmatics will find that their 'reliever' inhaler is likely to reverse the effects on the lung.
	8	
	9	
Very High	**10**	The effects on sensitive individuals described for 'High' levels of pollution may worsen.

Boundaries Between Index Points for Each Pollutant

Band	Index	Ozone *		Nitrogen Dioxide		Sulphur Dioxide		Carbon Monoxide		PM10 Particles
		8 hourly running mean or hourly mean		hourly mean		15 minute mean		8 hour running mean		24 hour running mean
		$\mu g/m^3$	ppb	$\mu g/m^3$	ppb	$\mu g/m^3$	ppb	mg/m^3	ppm	$\mu g/m^3$
Low										
	1	0-32	0-16	0-95	0-49	0-88	0-32	0-3.8	0.0-3.2	0-16
	2	33-66	17-32	96-190	50-99	89-176	33-66	3.9-7.6	3.3-6.6	17-32
	3	67-99	33-49	191-286	100-149	177-265	67-99	7.7-11.5	6.7-9.9	33-49
Moderate										
	4	100-126	50-62	287-381	150-199	266-354	100-132	11.6-13.4	10.0-11.5	50-57
	5	127-152	63-76	382-476	200-249	355-442	133-166	13.5-15.4	11.6-13.2	58-66
	6	153-179	77-89	478-572	250-299	443-531	167-199	15.5-17.3	13.3-14.9	67-74
High										
	7	180-239	90-119	573-635	300-332	532-708	200-266	17.4-19.2	15.0-16.5	75-82
	8	240-299	120-149	363-700	333-366	709-886	267-332	19.3-21.2	16.6-18.2	83-91
	9	300-359	150-179	701-763	367-399	887-1063	333-399	21.3-23.1	18.3-19.9	92-99
Very High										
	10	360 or more	180 or more	764 or more	400 or more	1064 or more	400 or more	23.2 or more	20 or more	100 or more

*** Note that in view of the transboundary nature of this pollutant, and thus the limited effectiveness of action on a local scale, Ozone is not included in the regulations for air quality management**

Purpose of the Progress Report

Progress Reports were introduced into the LAQM system following a detailed evaluation of the first round of local authority review and assessments. A need was identified to develop a longer-term vision for both LAQM and the review and assessment process. The process was seen to be too stop-start, possibly resulting in gaps of several years between air quality reviews.

Updating and screening assessments are now required at three yearly intervals, while annual progress reports maintain continuity in the intervening years. This encourages the integration of LAQM into the routine work of local authorities, and is intended to assist local authorities by:-

- helping retain a profile for LAQM within the authority, including the retention of staff with a knowledge of air quality issues
- providing a means for communicating air quality information to members and the public
- maximising the usefulness and interpretation of the monitoring effort being carried out by the local authority
- maximising the value of the investment in monitoring equipment
- making the next round of review and assessment that much easier, as there will be a readily available up-to date source of information
- helping local authorities respond to requests for up-to-date information on air quality
- providing information to assist in other policy areas, such as transport and land use planning
- providing a ready source of information on air quality for developers carrying out environmental assessments for new schemes
- demonstrating progress with implementation of air quality Action Plans and/or air quality strategies
- providing a timely indication of the need for further measures to improve air quality, rather than delaying until the next full round of review and assessment

New Monitoring Results

Automatic Air Quality Monitoring

Norwich has two sites within it's boundaries funded by the Dept of the Environment, Food and Rural Affairs (Defra). The Norwich Centre site is part of their Automated Urban and Rural Network (AURN), and the council owned Norwich Forum Roadside site is affiliated to the AURN. This latter site is relatively new, being commissioned on 14th February 2005. The analyser was previously located in Ber Street as the Norwich Roadside site. The City Council vacated the offices however, and consequently the analyser was moved to it's new location at City Hall. Norwich Centre is an 'urban background' site whilst Norwich Forum Roadside is a 'roadside' site.

The council also operates a mobile air quality monitoring station as part of the AEA 'Calibration Club'. The QA/QC for this partnership is in line with that for the AURN. The unit was located on Market Avenue, which is within the Castle AQMA, for the first half of 2004, and at Norwich Airport for the remainder.

The Norwich Centre and mobile sites use Ambirak analysers. These continuously monitor NO_2, CO, SO_2 and PM_{10}. The Norwich Forum Roadside site monitors NO_2 only.

All automatic data contained within this report has been fully ratified by AEA Technology. Data capture is at least 90% except where quoted.

Estimated background air pollution data for the Norwich City area can be viewed at:

www.airquality.co.uk/archive/laqm/tools/187_2001.csv

Diffusion Tubes

The council presently monitors NO_2 at 32 locations throughout the City, using diffusion tubes on a monthly exposure basis. These tubes are supplied and analysed by Gradko International Ltd. The method of preparation is 50% TEA/Acetone, and the values are blank corrected using travelling blanks. Gradko's quality control includes measuring tubes spiked with a known concentration of nitrite solution, measurement of stock solution received from AEA (these results are used as part of the UK NO_2 Survey), and the laboratory measurements are monitored by participation in an external Laboratory Proficiency Scheme ie W.A.S.P (implemented by the Health and Safety Laboratory at Sheffield).

The results shown in this progress report have been adjusted for bias using the Review and Assessment helpdesk website at www.uwe.ac.uk/aqm/review.

As always, occasional vandalism or theft of tubes from a few sites lead to some loss of data for the year. However, the overall loss of data has reduced from 2003 when the additional sites for 2004 are considered.

A problem with the analysis of the diffusion tubes for June 2004, lead to the loss of data for all of the locations for this month.

Benzene

In 2003 the average background benzene concentration, estimated from the UK background maps, was 0.6 µg/m^3 as an annual mean, and the maximum background level was 0.8 µg/m^3.

The projected average background benzene concentration estimated for 2010 is 0.5 µg/m^3, and the maximum background level is 0.6 µg/m^3.

Measurements using diffusion tubes at three locations in Norwich (Unthank Rd, Guildhall and St Augustines St), showed a maximum annual mean at St Augustines St of 5.94 µg/m^3. This concentration does not exceed the air quality objective of 16.25 µg/m^3. Monthly average concentrations for 2004 are plotted in Appendix 2.

1,3-Butadiene

In 2003 the average background 1,3-butadiene concentration, estimated from the UK background maps, was 0.2 µg/m^3 as an annual mean, and the maximum was 0.3 µg/m^3.

There are no authorised industrial processes within Norwich that have the potential to emit significant quantities of 1,3-butadiene.

No monitoring of 1,3-butadiene has been undertaken by Norwich City Council.

Carbon Monoxide (CO)

There were no exceedences of the air quality strategy objective of 10 mg/m^3 for carbon monoxide in 2004.

Monitoring data is available for carbon monoxide from the Norwich Centre site. In 2004, summary statistics for this site showed a maximum 8 hour running mean of 3.5 mg/m^3.

Data from the mobile monitoring unit for the period 30th Sept 2003 to 11th June 2004 (Market Avenue), showed a maximum 8 hour running mean of 3.4 mg/m^3.

During the period 14th June 2004 to 28th February 2005, the unit was located at Norwich Airport, close to the freight handling buildings. Data for this period showed a maximum 8 hour running mean of 3.8 mg/m^3.

Further monitoring data for carbon monoxide is available for the Norwich City area on the UK National Air Quality Information Archive website at www.airquality.co.uk

Lead (Pb)

Only one potential source of exceedence was revealed during the stage 1 review and assessment. This was screened out during stage 2. There are no authorised industrial processes within Norwich that have the potential to emit significant quantities of lead. It is expected that the objectives for lead will be achieved for 2008.

Fine Particles (PM_{10})

The UK Government and the devolved administrations have adopted two air quality objectives for fine particles (PM_{10}) which are equivalent to the EU Stage 1 limit values in the first Air Quality Daughter Directive. The objectives relevant to Norwich City Council are 40 µg/m^3 as the annual mean, and 50 µg/m^3 as the fixed 24 hour mean to be exceeded on no more than 35 days per year, to be achieved by the end of 2004.
Results from the Norwich Centre site showed that PM_{10} concentrations were recorded in the Defra 'moderate' band on 45 occasions over three days in December 2004. This band covers the range of 50 to 74 µg/m^3 expressed as a 24hr running mean. The maximum 24hr running mean was 59 µg/m^3.

The Defra objective value of 50 µg/m^3 based on daily gravimetric equivalent data was exceeded on 1 occasion during 2004. The objective allows up to 35 exceedences per year. The mean concentration of 22 µg/m^3 gravimetric equivalent was below the Defra annual mean objective value of 40 µg/m^3.

Results from the mobile site based at Market Avenue during the period 30th Sept 2003 to 11th June 2004, showed that PM_{10} concentrations were recorded in the Defra 'moderate' band on 2 occasions. The Defra objective value of 50 µg/m^3 based on daily gravimetric equivalent data was exceeded on 3 occasions during this period. The objective allows up to 35 exceedences per year. The mean concentration of 17 µg/m^3 gravimetric equivalent, was below the Defra annual mean objective value of 40 µg/m^3.

Results from the mobile site during it's time at Norwich Airport for the period 14th June 2004 to 28th February 2005, showed that PM10 concentrations were recorded in the Defra 'low' band for the whole period. The Defra objective value of 50 µg/m3 based on daily gravimetric equivalent data was exceeded on 2 occasions during this period. The objective allows up to 35 exceedences per year. The mean concentration of 14 µg/m3 gravimetric equivalent, was below the Defra annual mean objective value of 40 µg/m3.

The Design Manual for Roads and Bridges (DMRB) screening model indicated that the annual mean objective for PM_{10} would be met in 2004, but that exceedences of the proposed 2010 objective are likely. It is not yet possible to declare an AQMA for the 2010

PM_{10} objective, as it is not currently included in the Air Quality Regulations. Norwich City Council has therefore decided not to proceed to a detailed assessment at this time, but will take into consideration having to comply with the objective, if it is implemented, when deciding on future monitoring strategies.

Sulphur Dioxide (SO_2)

There were no exceedences of the air quality strategy objectives for sulphur dioxide in 2004.

Monitoring data is available for SO_2 from the Norwich Centre site. In 2004, summary statistics for this site showed a maximum 24 hour mean of 33 µg/m^3, with a daily maximum of 56 µg/m^3.

Data from the mobile monitoring unit for the period 30th Sept 2003 to 11th June 2004 (Market Avenue), showed a maximum 24 hour mean of 27 µg/m^3, a maximum hourly mean of 61 µg/m^3, and a maximum 15 minute mean of 74 µg/m^3.

During the period 14th June 2004 to 28th February 2005, the unit was located at Norwich Airport, close to the freight handling buildings. Data for this period showed a maximum 24 hour mean of 26 µg/m^3, a maximum hourly mean of 59 µg/m^3, and a maximum 15 minute mean of 128 µg/m^3.

Further monitoring data for sulphur dioxide is available for the Norwich City area on the UK National Air Quality Information Archive website at www.airquality.co.uk

Nitrogen Dioxide (NO_2)

Nitrogen Dioxide and Nitric Oxide are both oxides of nitrogen, which together are referred to as NO_x. All combustion processes produce some NO_x, but only NO_2 is associated with adverse effects on human health. NO_2 is mainly a secondary pollutant formed by the oxidation of nitric oxide in the atmosphere. On a national level, the main sources of NO_x are road transport (48%), power generation (20%), other industry (15%) and domestic sources (4%). The remainder arises from other forms of transport and commercial heating systems. In urban environments the contribution from road traffic will be much higher, and in the absence of localised point sources will account for the majority of

the NO_2 present. Measures to reduce traffic pollution will therefore play a major role in meeting the air quality objective for NO_2. Such schemes have been included in Norwich's Air Quality Action Plan, which was submitted to Defra in 2004.

Automatic Monitoring

Monitoring data is available for NO_2 from the Norwich Centre site. In 2004, statistics for this site showed a maximum hourly mean of 103 µg/m^3 with an annual mean of 21 µg/m^3. These concentrations do not exceed the air quality objectives. Daily average concentrations for 2004 are plotted in Appendix 2.

Monitoring data is also available for NO_2 from the Norwich Roadside site. In 2004, statistics for this site showed a maximum hourly mean of 128 µg/m^3, with an annual mean of 29 µg/m^3. These concentrations do not exceed the air quality objectives. Daily average concentrations for 2004 are plotted in Appendix 2.

Data from the mobile monitoring unit for the period 30th Sept 2003 to 11th June 2004 (Market Avenue), showed a maximum hourly mean of 124 µg/m^3, with an annual mean of 42 µg/m^3. The latter figure represents an exceedence of the annual air quality objective of 40 µg/m^3. However, technical problems with the analyser during the period meant that the data capture was 86%. This is below the recommended level of 90% which should be considered when interpreting the data. Also, the monitoring period spans two calendar years, and may not be representative of 2004 as a whole.

During the period 14th June 2004 to 28th February 2005, the unit was located at Norwich Airport, close to the freight handling buildings. Data for this period showed a maximum hourly mean of 115 µg/m^3, with an annual mean of 19 µg/m^3. These concentrations do not exceed the air quality objectives.

Further monitoring data for Nitrogen dioxide is available for the Norwich City area on the UK National Air Quality Information Archive website at www.airquality.co.uk

Non-Automatic Monitoring

Monitoring data from our continuing diffusion tube study is also included in Appendix 2. Several of the monitoring positions were new in Summer 2004. Therefore, it has not been possible to calculate annual means in some cases due to the limited number of exposure months. These calculations will be included in future reports. Also included are projected concentration levels for 2005, based on the 2004 data.

A table showing the summary data for NO_2 in 2004 is also given in Appendix 2. As can be seen, there are six locations that predict an exceedence of the 2005 annual mean objective of 40 µg/m^3 that are not currently within any of the AQMA's. These locations are as follows:

1. Earlham Road

   Earlham Road is a busy radial road with residential properties along much of it's length. The diffusion tube is located at the kerbside at the western end of the road, close to the district boundary. The distance from the kerbside to the façade of the nearest residential premises is approx 30m. Concentrations will naturally be lower at the building façade than the kerbside. Reference to the review and assessment helpdesk website gives guidance on the factor to apply to adjust kerbside results to estimate roadside (or façade) values. The correction in this case is 40.8 x 0.75, ie the concentration (40.8) multiplied by the distance correction factor (0.75). This gives a result of 30.6 µg/m^3, which is below the air quality objective for NO_2.

2. Tombland

   Tombland is a busy thoroughfare in an old part of Norwich, close to the Cathedral. It is bounded on all sides by commercial premises, public houses and restaurants. The diffusion tube is at the kerbside. There is no public exposure relevant to the air quality objectives for NO_2 at this location.

3. St Vedast Street
4. Eastbourne Place
5. Riverside

    These streets are in close proximity to one another, and the diffusion tubes are at kerbside locations. The area consists of commercial premises, public houses, night clubs and restaurants. There is no public exposure relevant to the air quality objectives for NO_2 at these locations.

6. St Stephens Street (mid)

    St Stephens Street is a busy through road for the centre of Norwich. Many road layout changes have been carried out in 2005 at the Northern end of the street, including restricting access to buses only from that direction. It is one of the main shopping areas in Norwich, consisting mainly of large department stores. There is no public exposure relevant to the air quality objectives for NO_2 at this location.

The remaining five locations that are shown with a potential exceedence of the 2005 annual mean objective of 40 µg/m^3 are all within the current AQMA's. The action plan that was produced in conjunction with Norfolk County Council sets out the proposals to address the air quality within these areas. Progress towards achieving the aims is given in Appendix 3.

New Local Developments

Industry

- No new industrial processes (A1 or A2) commenced operation during 2004, and overall, there was a reduction in the number of Part B processes authorised during the year.

- There were no new landfill or mineral developments during the year. No such activities are currently carried out within Norwich City Council's administrative area.

- There are no significant industrial developments planned for the City.

Housing and Redevelopment

- One large retail redevelopment is currently under construction within the City, at Chapelfield Road. This is a replacement for an existing factory and public car park. It is not anticipated that in the longer term this redevelopment will impact significantly on air quality over the previous land use, although additional monitoring has been put in place to assess any changes that may occur.

- Several other small to medium scale developments are currently under construction within the City, the largest of which is new housing on the site of the former Norfolk and Norwich Hospital. Other examples are the demolition and rebuilding of the Duke Street multi storey car park; the redevelopment of the former Bowthorpe School grounds for housing, and the continuing regeneration of the Riverside/King Street areas of Norwich. It is not anticipated that these developments will impact significantly on air quality once completed.

Road Network Changes

- Several temporary road closures, lane restrictions or diversions were again experienced within Norwich during 2004. These were mainly in connection with the aforementioned redevelopments. Some minor road layout changes are being incorporated into the designs for these areas also.

- A significant number of changes to the number and location of bus lanes were made during 2004. Several new lanes and contra flows were introduced to speed up bus journeys. This work involved many changes to the traffic light network to facilitate the introduction of the new lanes. New park and ride sites also came on line during the year.

Additional Information

Action Plan Progress Report

In March 2005 Defra issued an addendum to their LAQM Policy guidance. The revised guidance removes the requirement to produce separate air quality action plans where an air quality problem arises because of transport pollution. Instead, Local Authorities are free to address this through their Local Transport Plan (LTP). It is the intention of Norwich City Council to integrate their action plan within the LTP in partnership with Norfolk County Council. The table in Appendix 3 gives details on progress with the contents of the action plan.

Radiation Monitoring

Norwich City Council is also a member of the Norfolk Local Authorities Radiation Monitoring Group (NLARMG). The group carry out measurements of the external background Gamma radiation levels across the county of Norfolk. The group is accredited by the Local Authority Radiation and Radioactivity Monitoring Advice and Collation Centre (LARRMACC), who audit the members and results for quality control.

The monitoring results are fed into a database held by Norfolk County Council. This benchmark data would be used as part of the emergency plan response to a radiation incident, should the need arise. The group took part in a successful county-wide exercise in 2003 to test the effectiveness of communications and working in unfamiliar territories etc. A further smaller scale exercise is planned for late 2005.

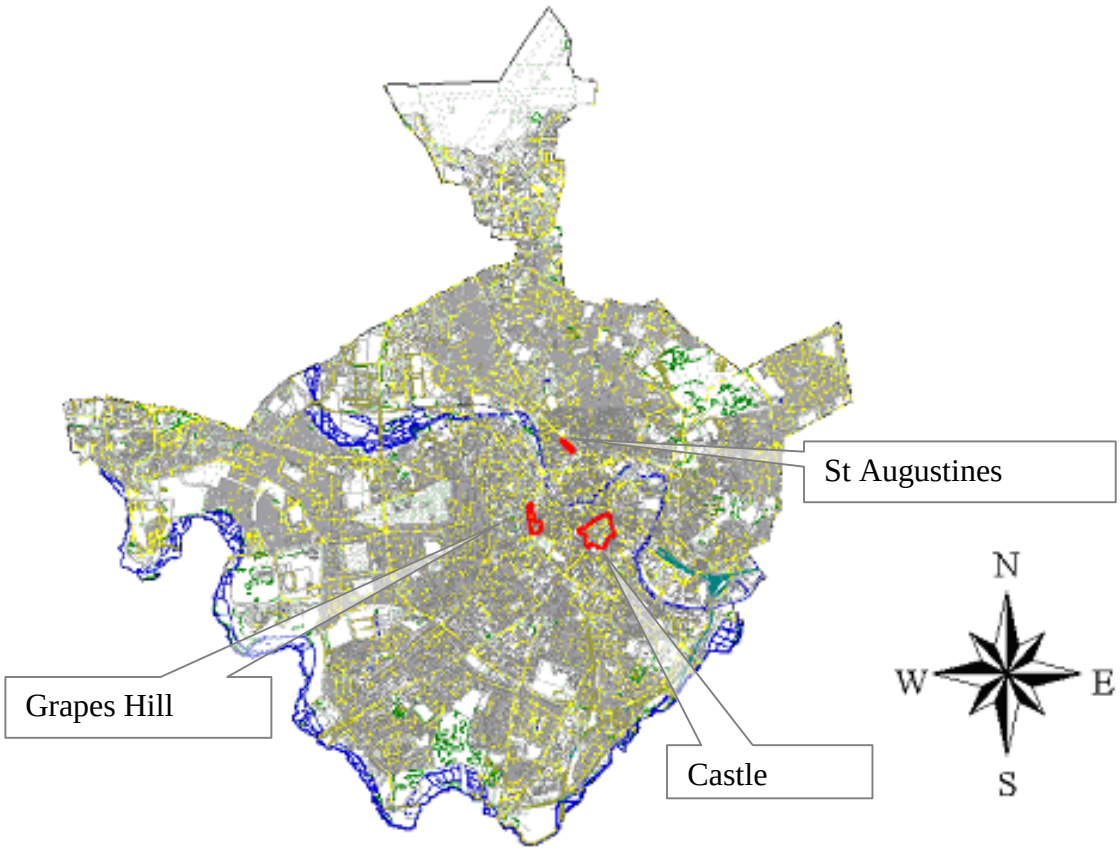
Norwich has six sites that are monitored on a monthly basis. Technical problems with the equipment during 2004 lead to the loss of some data. Results of the monitoring carried out in 2004 are given in Appendix 2.

Appendix 1

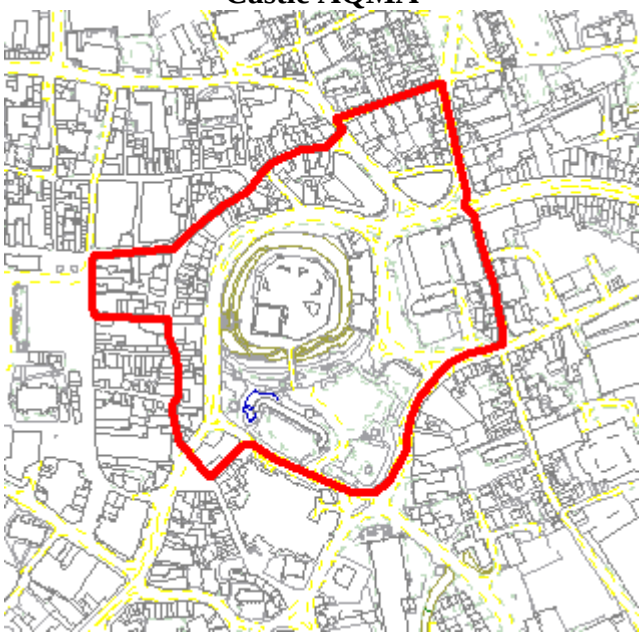
Air Quality Management Areas in Norwich

CONTENTS

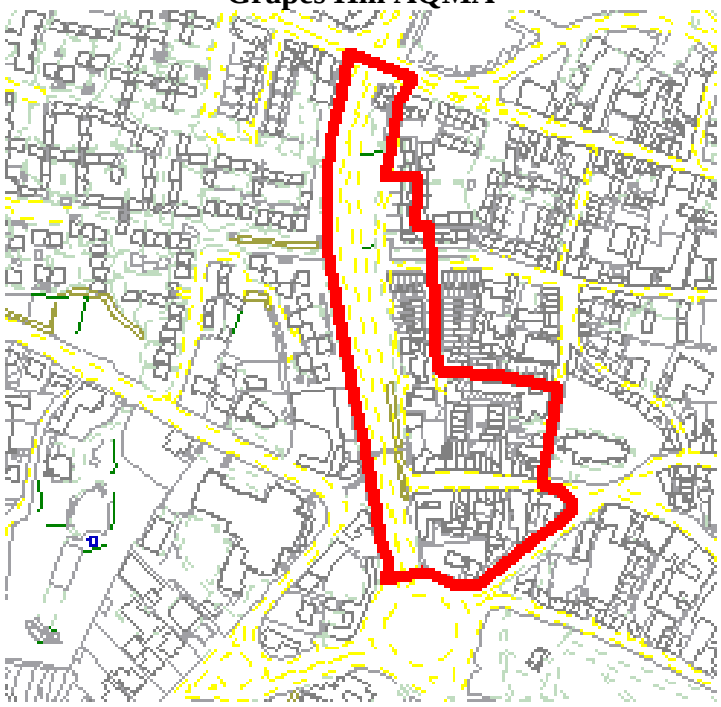
Air Quality Management Areas in Norwich



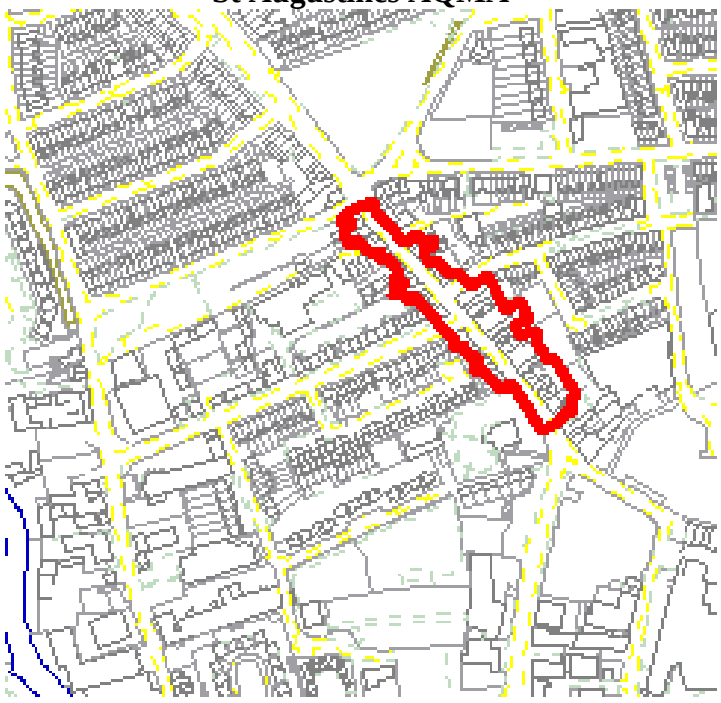
Castle AQMA



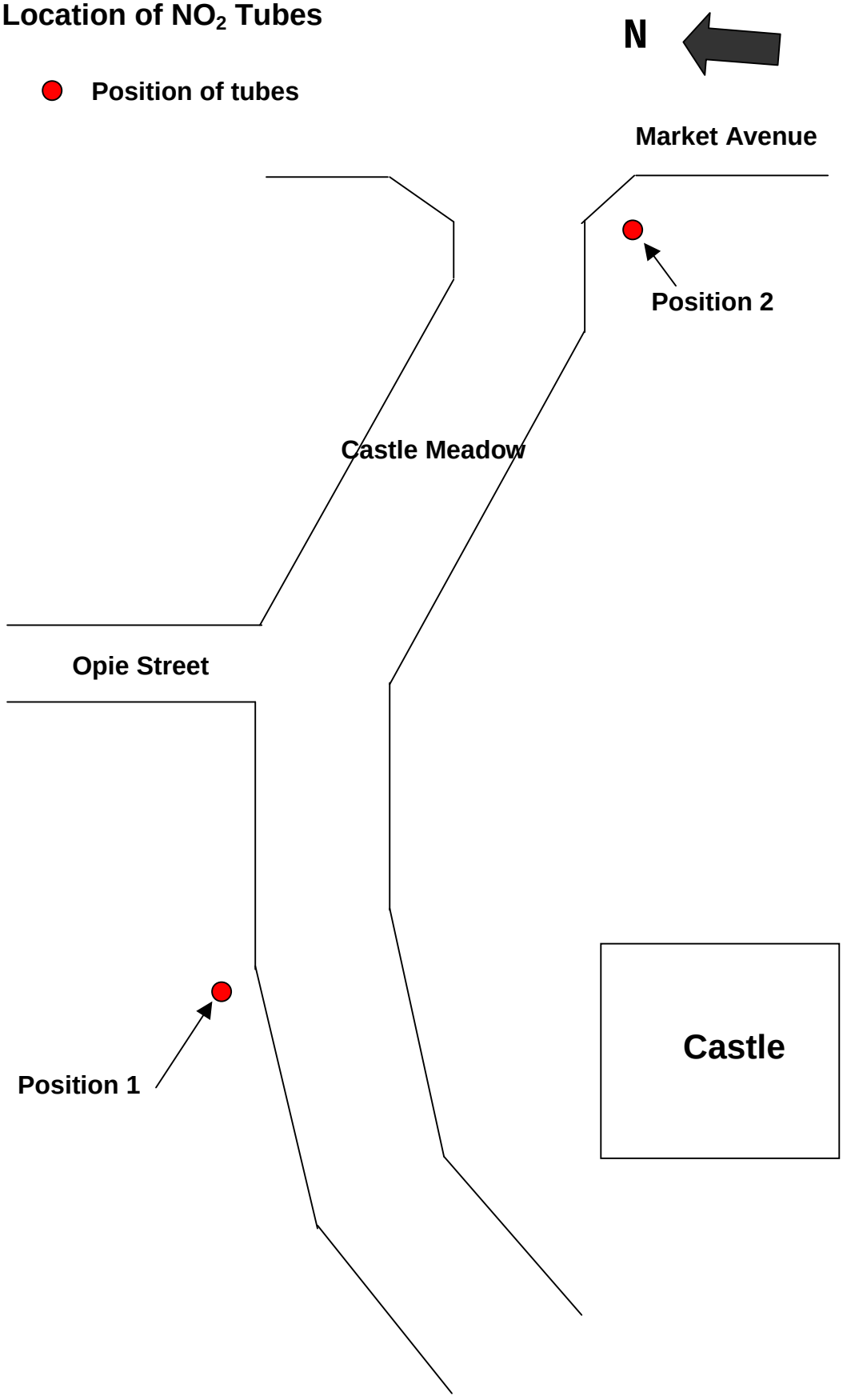
Grapes Hill AQMA



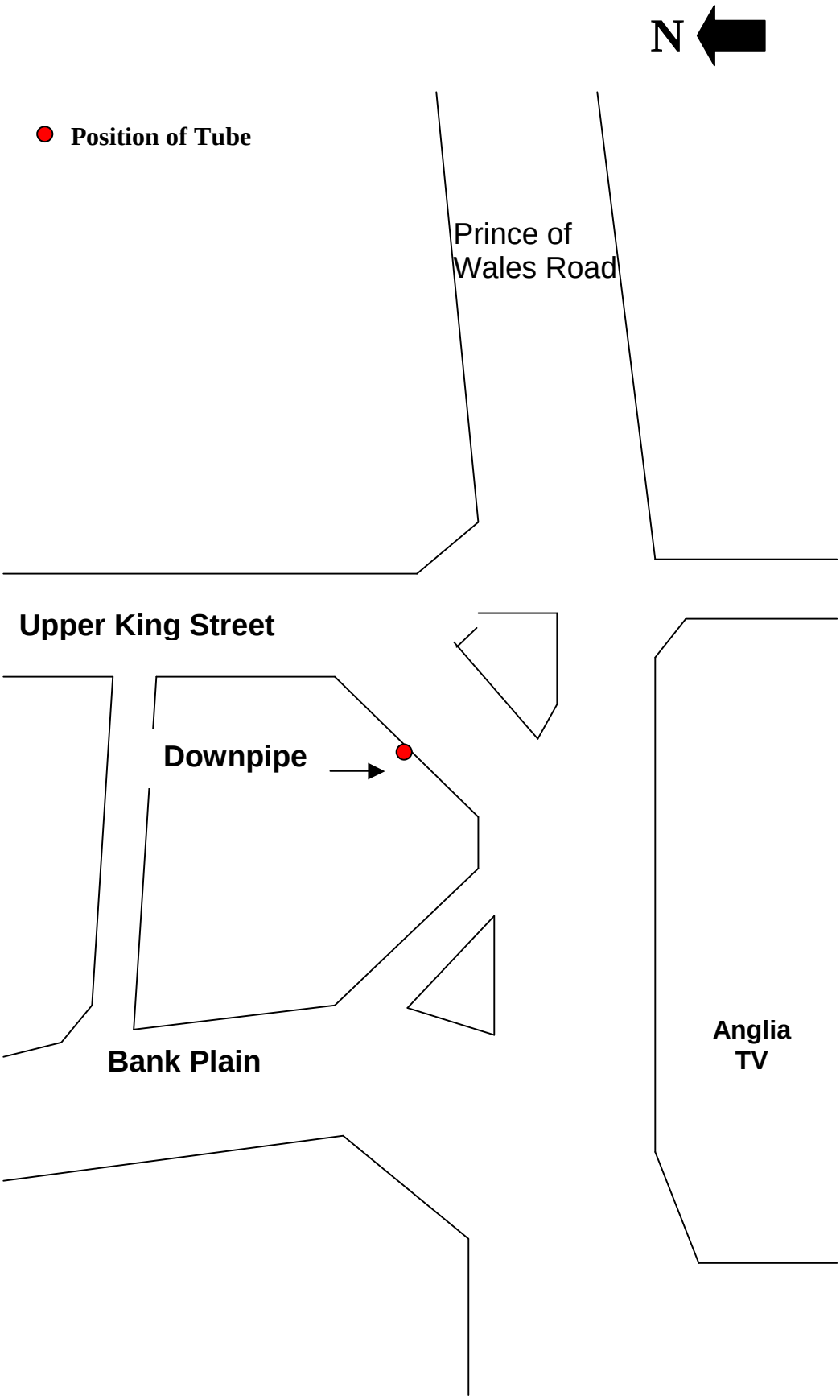
St Augustines AQMA



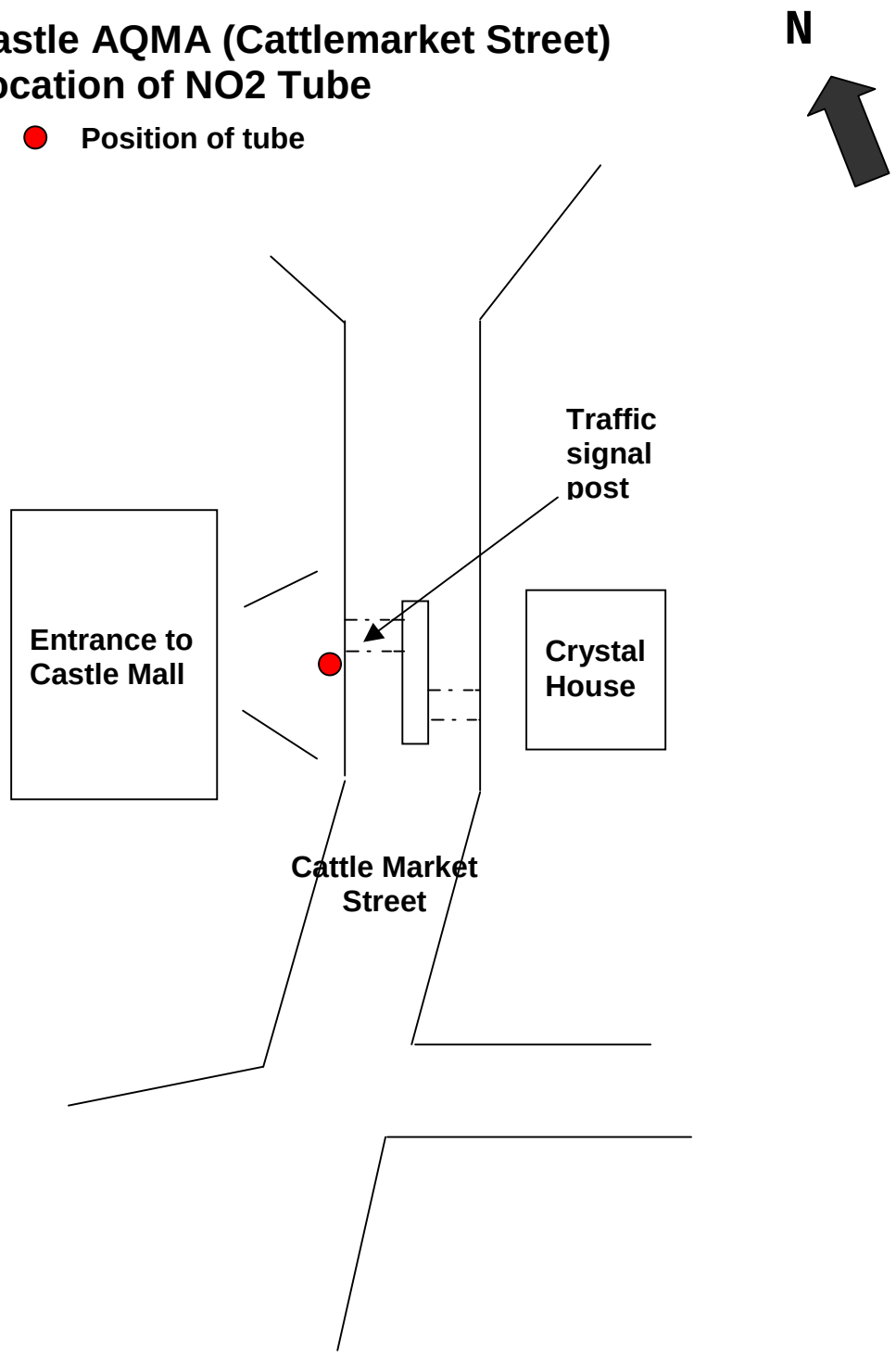
Castle AQMA (Castle Meadow)
Location of NO_2 Tubes

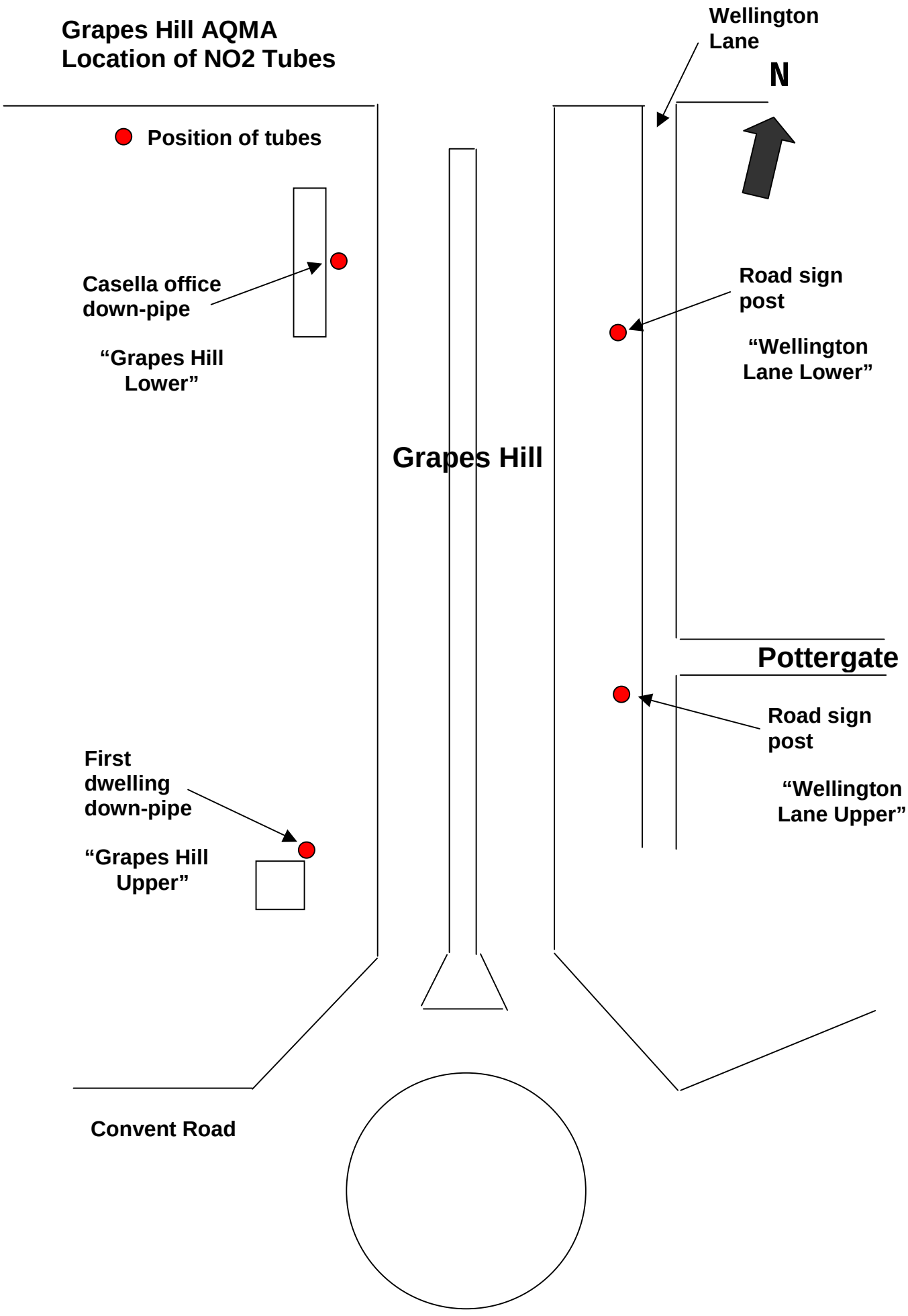


Castle AQMA (Upper King Street)
Location of NO_2 Tube

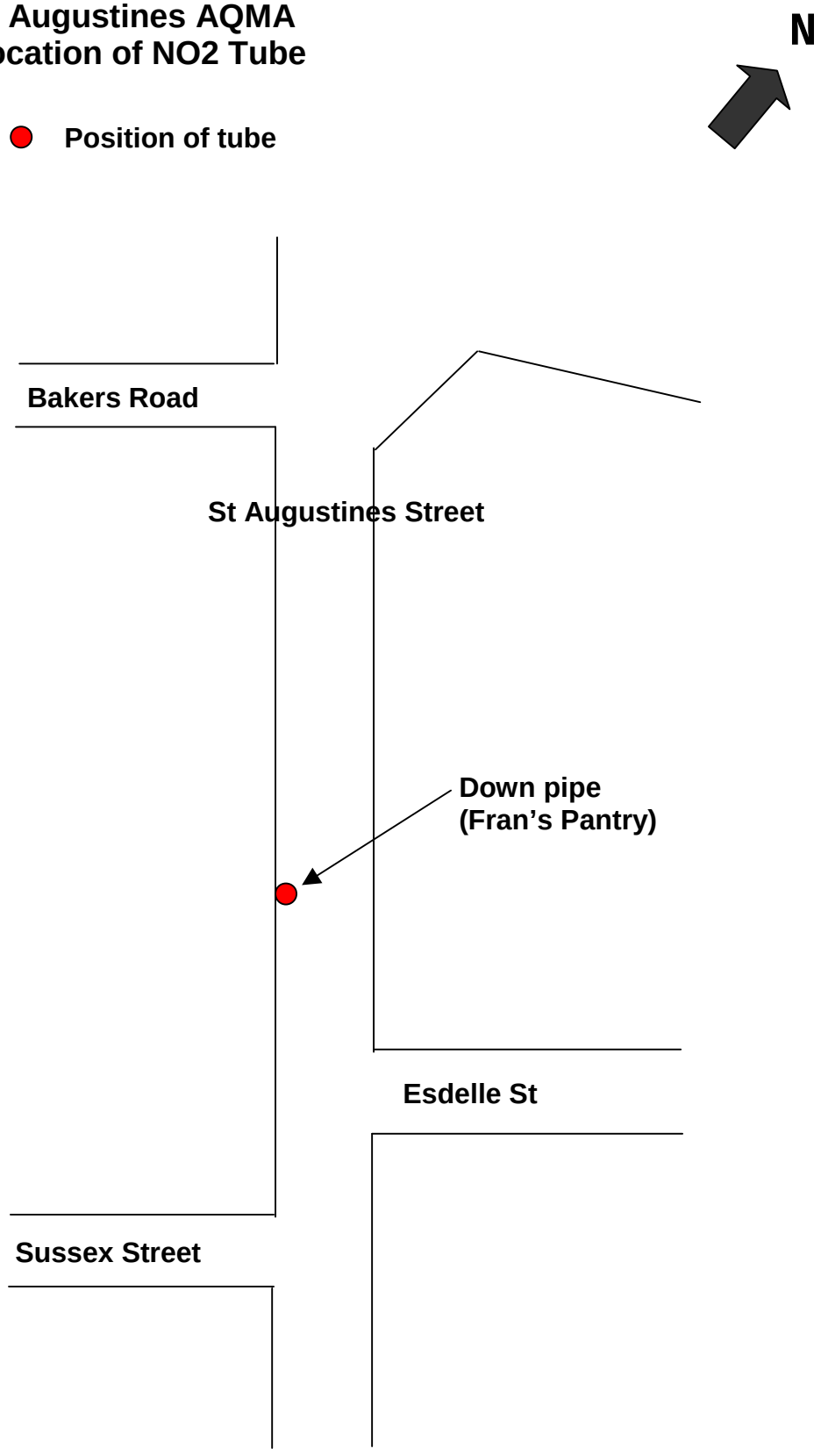


Castle AQMA (Cattlemarket Street)
Location of NO2 Tube




Grapes Hill AQMA
Location of NO2 Tubes
Wellington Lane
N
Position of tubes
Casella office down-pipe
"Grapes Hill Lower"
Road sign post
"Wellington Lane Lower"
Grapes Hill
Pottergate
Road sign post
"Wellington Lane Upper"
First dwelling down-pipe
"Grapes Hill Upper"
Convent Road

St Augustines AQMA
Location of NO2 Tube

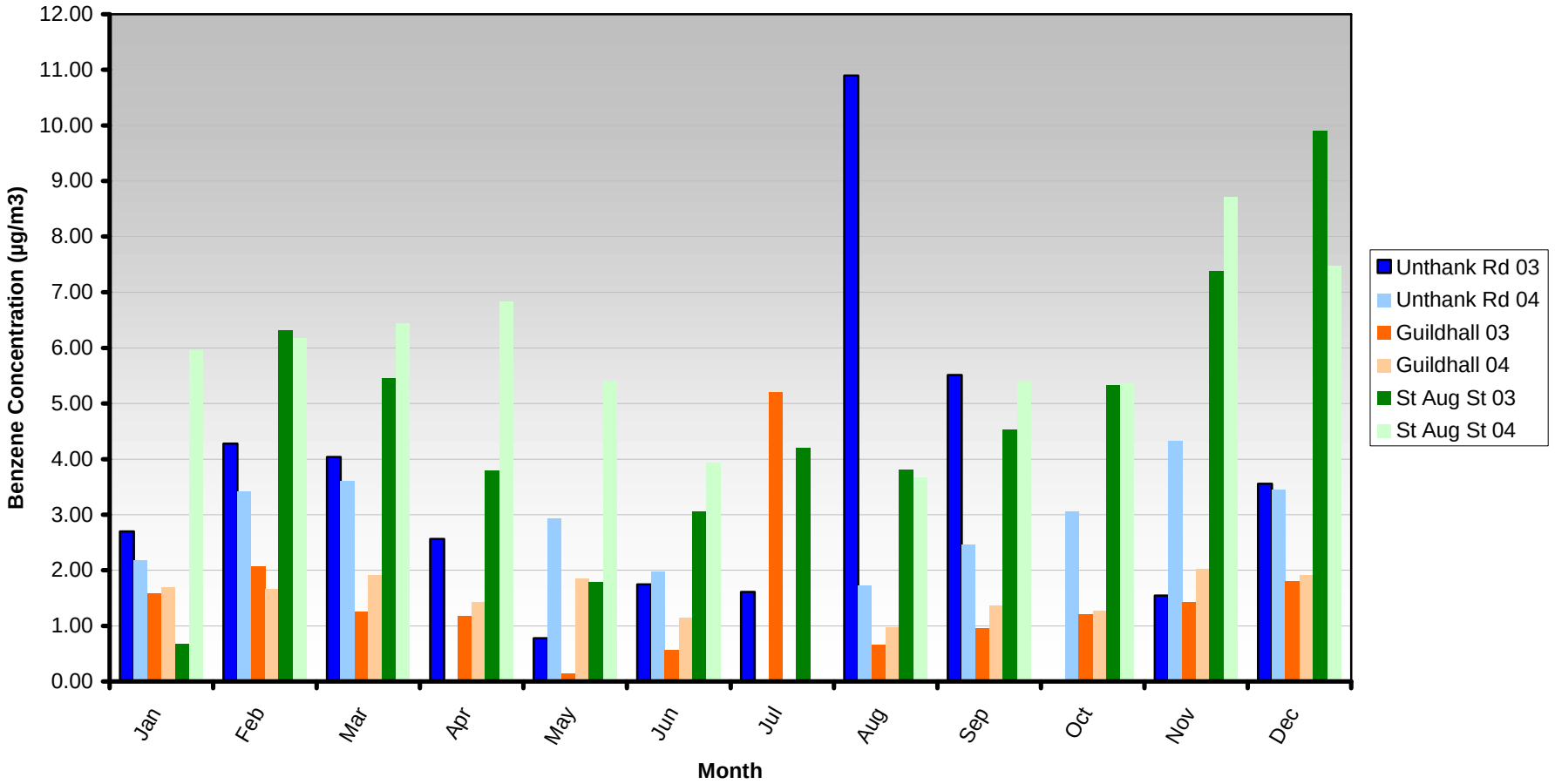


Appendix 2

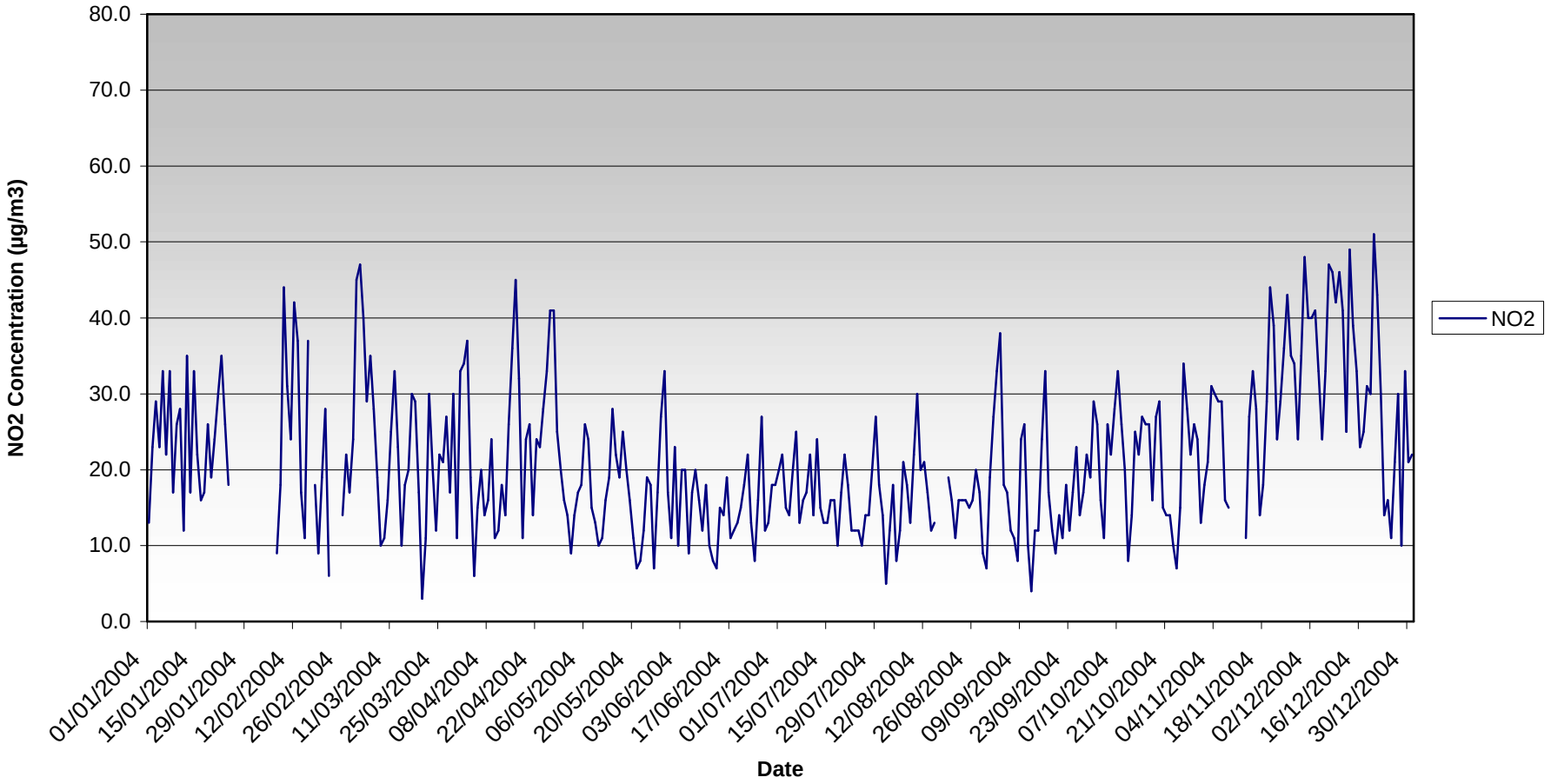
Monitoring Data

CONTENTS

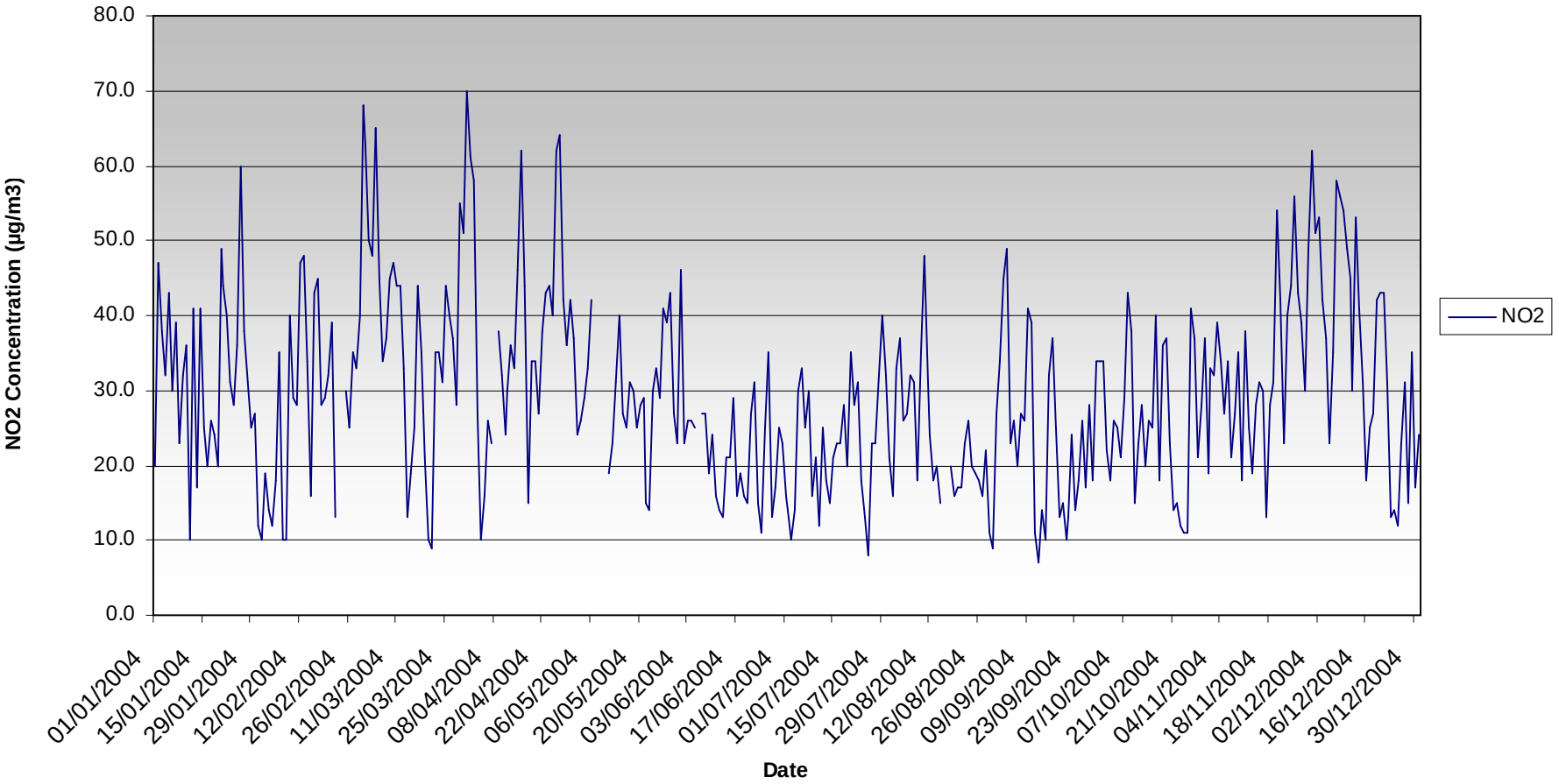
Benzene Diffusion Tube Survey
Monthly Averages 2003/04



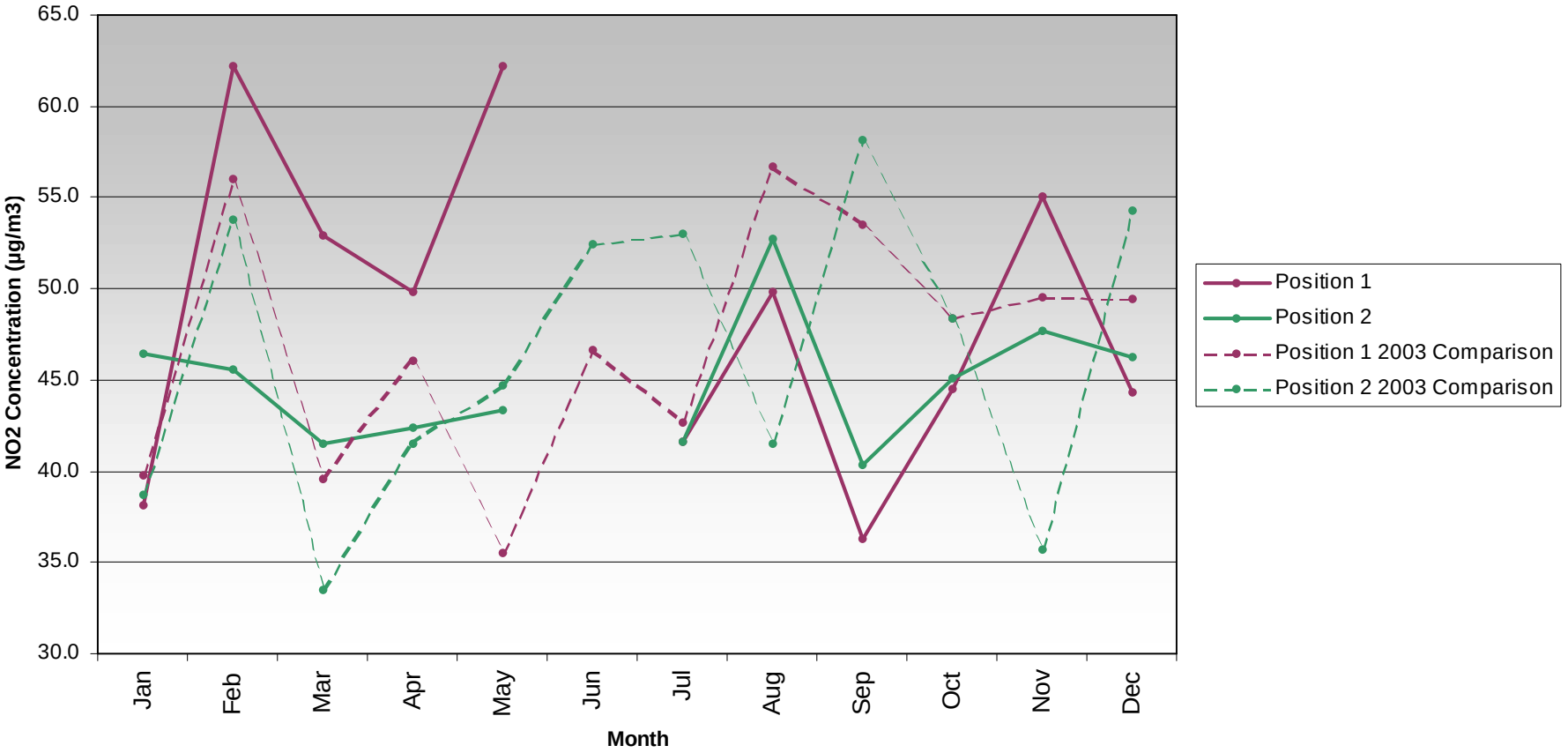
Norwich Centre Daily Mean Values 2004



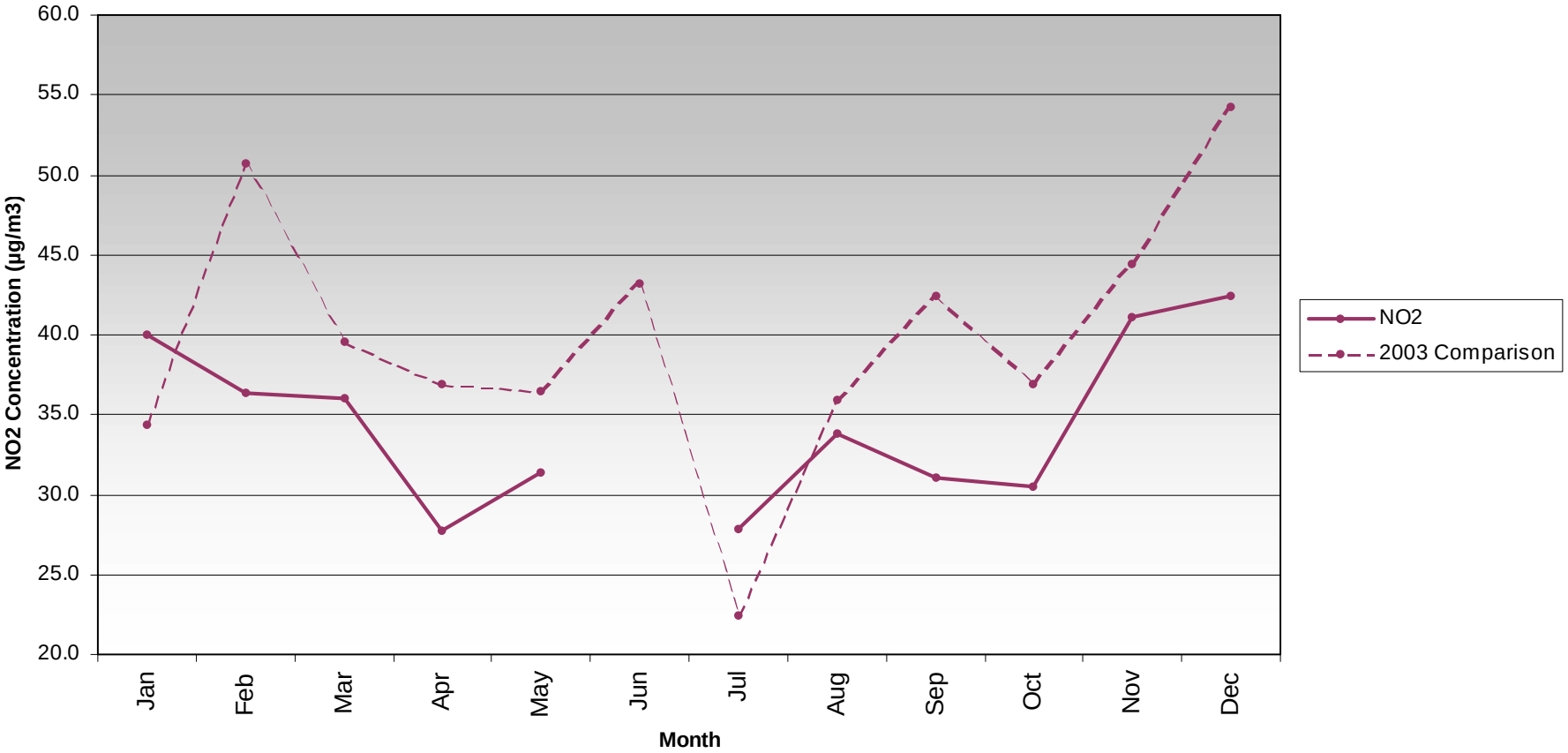
Norwich Roadside Daily Mean Values 2004



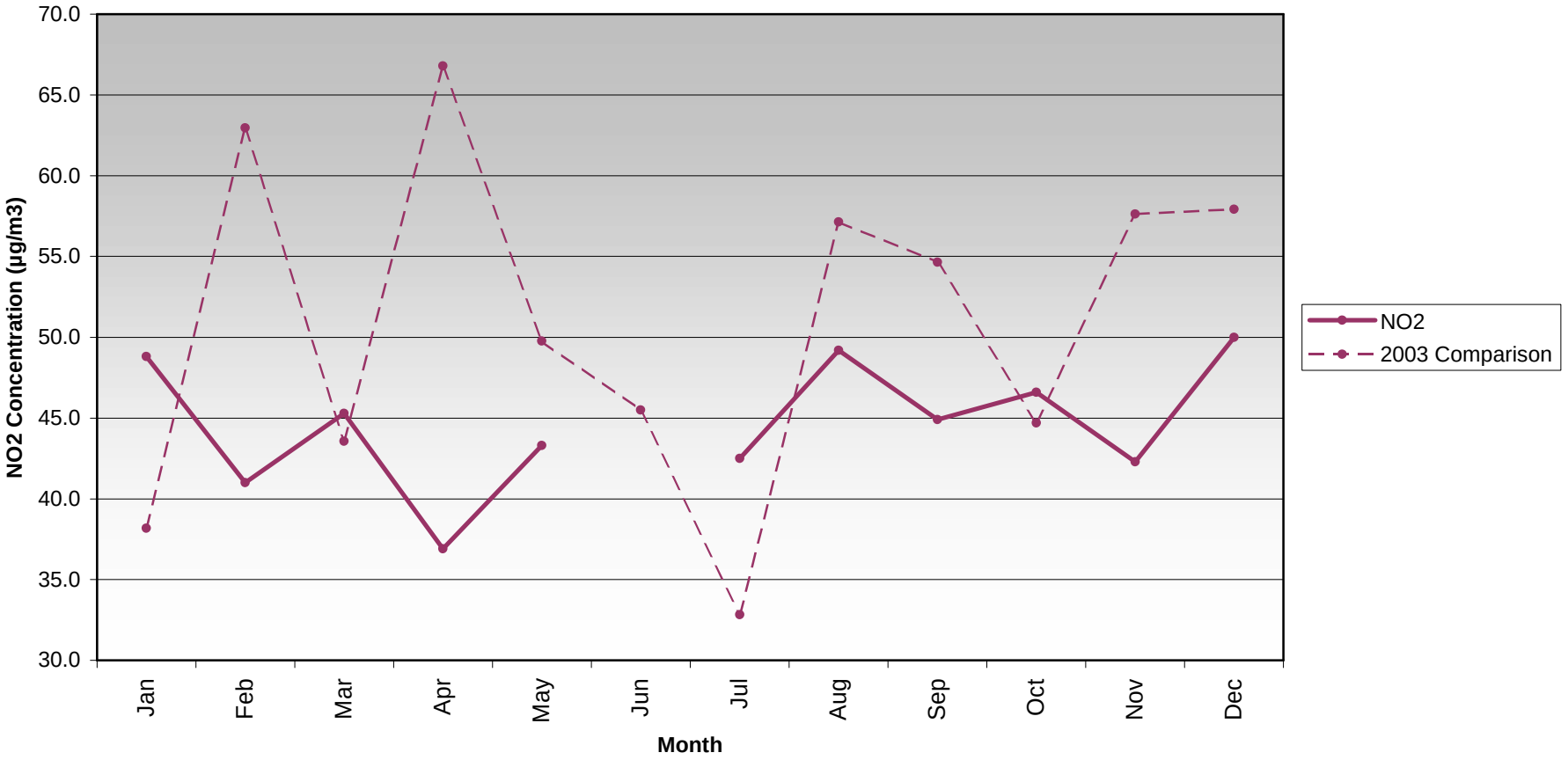
Castle AQMA
Castle Meadow Diffusion Tubes 2004

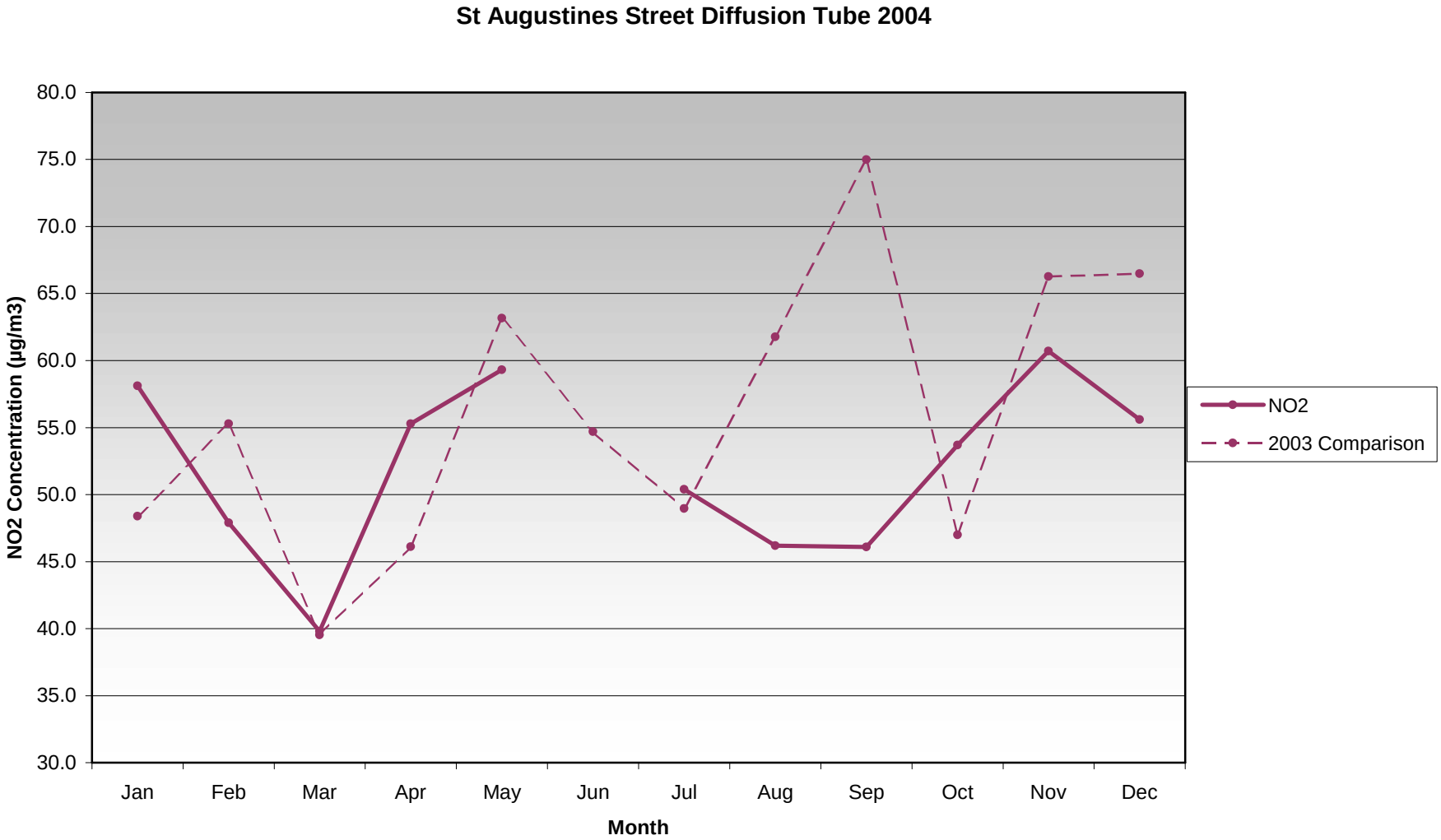


Castle AQMA
Upper King Street Diffusion Tube 2004



Castle AQMA
Cattle Market Street Diffusion Tube 2004




St Augustines Street Diffusion Tube 2004
80.0
75.0
70.0
65.0
60.0
55.0
50.0
45.0
40.0
35.0
30.0
NO2 Concentration (µg/m3)
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Month
NO2
2003 Comparison

2004 Monthly Uncorrected NO_2 Concentrations ($\mu g/m^3$)

Location	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean	Corrected * Annual Mean
Earlham Rd	31.2	41.0	35.5	39.2	43.8		39.1	42.1	32.3	32.3	43.5	38.0	38.0	**41.8**
Colman Rd	37.1	36.4	34.7	31.4	35.0		29.3	33.2	29.4	29.3	31.8	35.8	33.0	**36.3**
Vulcan Road	2.0	36.9	33.9	39.2	28.4		36.2	43.8	29.9	45.3	40.4	41.3	34.3	**37.7**
Heartsease	32.7	29.9	24.8	24.9			28.5	32.6	29.4	26.8	30.7	33.8	29.4	**32.4**
Tombland	48.8	40.5	44.1	34.1	36.1		37.1	40.9	38.0	41.4	49.6	46.1	41.5	**45.7**
Upper King St	40.0	36.4	36.0	27.7	31.4		27.8	33.8	31.1	30.5	41.1	42.4	34.4	**37.8**
St Vedast St	33.7				26.1		33.0	45.0	27.6	37.8	50.3	47.4	37.6	**41.4**
Eastbourne Pl	46.4	45.2	42.4	36.9	41.5		30.1	43.8	26.5	38.2	41.4	39.9	39.3	**43.2**
Riverside	42.5	49.3	50.4	49.8	56.3		50.7	45.6	38.6	41.6	53.2	48.4	47.9	**52.6**
Cattlemarket St	48.8	41.0	45.3	36.9	43.3		42.5	49.2	44.9	46.6	42.3	50.0	44.6	**49.1**
St Stephens (mid)				46.5	43.9		44.8	46.2	32.8	49.3	46.9	44.0	44.3	**48.7**
St Stephens	30.3	36.9	38.9	43.8	43.3		33.6	38.5	25.9	37.1	42.3	36.8	37.0	**40.7**
Victoria Street				36.9	38.5		29.5	30.2	26.5	28.6	37.7	37.4	33.2	**36.5**
Ipswich Rd	26.8	27.2	29.9	30.4	17.2		19.0	18.4	19.0	26.5	28.6	29.6	24.8	**27.3**
Unthank Rd	30.3	36.4	34.0	33.2	23.7		30.1	36.1	27.1	32.4	41.4	38.1	33.0	**36.3**
Bignold School				16.1	15.4		17.1	20.1	15.6	24.0	29.4	29.6	20.9	**23.0**
Chapelfield/Wessex St				42.4	27.3		31.2	31.4	29.4	30.2	32.5	32.1	32.1	**35.3**
Chapelfield/Crescent				41.5	34.4		35.6	36.1	29.9	35.9	37.2	34.8	35.7	**39.2**
Johnson Place	48.3	42.9	40.3	46.1	32.6		40.0	42.1	39.8	41.6	38.3	48.2	41.8	**46.0**
Chantry Road				27.2	29.0			31.4	25.3					
Theatre Street				26.3	25.5		25.1	48.6	29.4	36.6	46.9	45.7	35.5	**39.1**
Castle Meadow	38.1	62.2	52.9	49.8	62.2		41.6	49.8	36.3	44.5	55.0	44.3	48.8	**53.7**
Castle Meadow 2	46.4	45.6	41.5	42.4	43.3		41.6	52.7	40.3	45.1	47.7	46.2	44.8	**49.3**
Exchange St	41.5	36.9	37.2	36.9	27.9		36.8	31.4	30.0	41.8	34.3	40.9	36.0	**39.6**
St Georges St	37.9	25.8	20.9	20.7	18.7		19.5	18.2	18.4	24.0	29.0	33.8	24.3	**26.7**
St Augustines	58.1	47.9	39.8	55.3	59.3		50.4	46.2	46.1	53.7	60.7	55.6	52.1	**57.3**
Grapes Hill (lower)							31.8				24.9	30.2		
Grapes Hill (upper)							24.5	27.3	20.2	26.7	21.1	22.4		
Wellington La (lower)							28.5	31.4	21.3	31.0	35.7	36.9		
Wellington La (upper)							28.5	37.3	31.1	37.6	44.5	38.8		
Guildhall	32.7	31.8	29.0	20.3	24.9		22.3	23.1	25.4	27.4	37.2	34.9	28.1	**30.9**
Ber St	25.5	29.0	21.4	23.2	25.2		26.9	26.9	26.5	28.3	39.2	36.2	28.0	**30.8**

* Bias Adjustment Factor (A) = 1.1

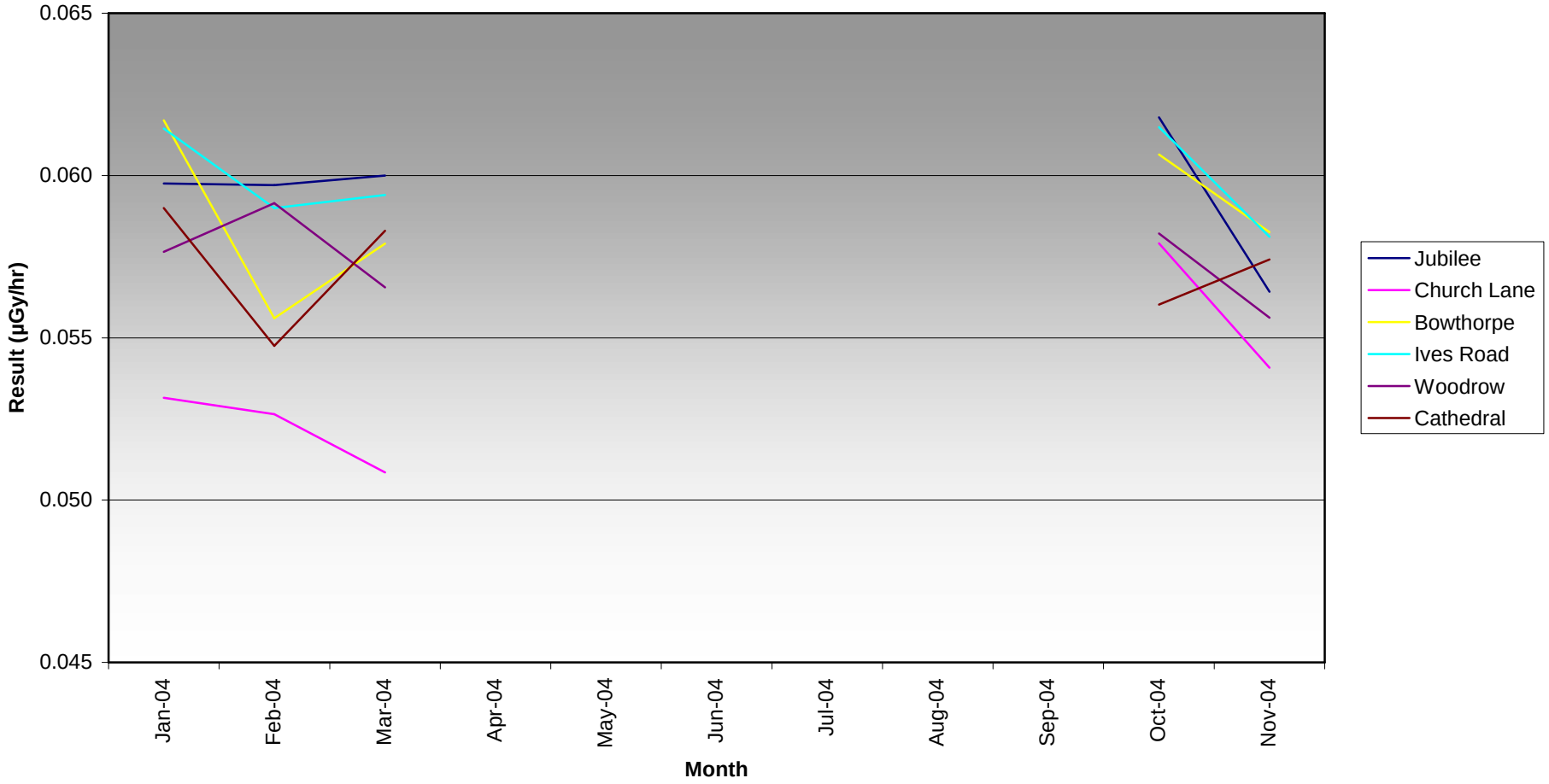
Summary NO_2 Diffusion Tube Data 2004

Location	2004 Annual Mean ($\mu g/m^3$)	Corrected Annual Mean[2] ($\mu g/m^3$)	2005 Projected Annual Mean[1] ($\mu g/m^3$)	Exceedence of 2005 Objective of 40 µg/m3	AQMA
Earlham Rd	38.0	41.8	40.8	Y	N
Colman Rd	33.0	36.3	35.4	N	N
Vulcan Road	34.3	37.7	36.8	N	N
Heartsease	29.4	32.4	31.5	N	N
Tombland	41.5	45.7	44.5	Y	N
Upper King St	34.4	37.8	36.9	N	Y
St Vedast St	37.6	41.4	40.3	Y	N
Eastbourne Pl	39.3	43.2	42.1	Y	N
Riverside	47.9	52.6	51.3	Y	N
Cattlemarket St	44.4	48.9	47.6	Y	Y
St Stephens (mid)	44.3	48.7	47.5	Y	N
St Stephens	37.0	40.7	39.7	N	N
Victoria Street	33.2	36.5	35.6	N	N
Ipswich Rd	24.8	27.3	26.6	N	N
Unthank Rd	33.0	36.3	35.4	N	N
Bignold School	20.9	23.0	22.4	N	N
Chapelfield/Wessex St	32.1	35.3	34.4	N	N
Chapelfield/Crescent	35.7	39.2	38.3	N	N
Johnson Place	41.8	46.0	44.9	Y	Y
Chantry Road					N
Theatre Street	35.5	39.1	38.1	N	N
Castle Meadow	48.8	53.7	52.3	Y	Y
Castle Meadow 2	44.8	49.3	48.0	Y	Y
Exchange St	36.0	39.6	38.6	N	N
St Georges St	24.3	26.7	26.0	N	N
St Augustines	52.1	57.3	55.9	Y	Y
Grapes Hill (lower)					Y
Grapes Hill (upper)					Y
Wellington La (lower)					Y
Wellington La (upper)					Y
Guildhall	28.1	30.9	30.1	N	N
Ber St	28.0	30.8	30.1	N	N

[1] Correction factor derived from Guidance LAQM.TG(03) Box 6.6
0.892 / 0.915 = 0.9748633

[2] Bias adjustment factor determined from review and assessment helpdesk website
Gradko Laboratories, using 50% TEA in Acetone method for 2004 gives overall factor of 1.1

External Gamma Radiation Monitoring Results



Appendix 3
Action Plan Summary Table

Action plan measure	Original Timescale	Progress With Measure	Outcome to date	Comments
St Augustines Street				
UTC	Design 04/05 Implementation 05/06	None	No outcome to date	Use of UTC for reducing emissions in this AQMA was felt inappropriate after submission of the Action Plan.
Road Layout Changes	Design 04/05 Implementation 05/06	Design and implementation on schedule	No outcome to date	Detailed design nearing completion and planning to consult on detailed scheme by end of 2005
Castle Area				
Low Emission Zone	Design 04/05 Implementation 05/06	Project team established. Main work programme commences at the end of August 05	European match funding has been secured through CIVITAS	Development of Quality Bus Partnerships must be underway before detailed work on LEZ can begin. Also need to reconsider funding options for retrofitting buses, as Transport Energy grant programmes have abruptly ended.
Quality Bus Partnerships & Contracts	TBA	On-going discussions between County City and First. Principle agreed	No outcome to date	We are working to begin developing Quality Bus Partnerships as soon as possible
Public Transport Major Scheme	Implementation 04/05	To be completed August 2005	Reduced journey times and improved reliability for buses	New bus station will be completed in August 2005 and will work towards encouraging increased bus patronage by providing public transport users with high quality interchange facilities
Grapes Hill				
Road Layout Changes	Design 04/05 Implementation 05/06	None	No outcome to date	We are still investigating the feasibility of a number of potential measures but are having difficulty in developing an acceptable scheme for reducing traffic volumes and emissions, as this AQMA is on a Ring Road route which is the most appropriate for this traffic.

Appendix 3
Action Plan Summary Table

Action plan measure	Original Timescale	Progress With Measure	Outcome to date	Comments
		Area Wide Measures		
Park and Ride and Car Parking Policy	Ongoing	All programmed Park and Ride works complete	2,821,933 passengers using Park and Ride in 2004/05	5 Park and Rides sites in Norwich, with over 5,000 spaces - the most in the country
Soft Measures :				
Car Sharing	Ongoing	Relaunch and rebranding Autumn 2005	No outcome to date	New campaign will focus on reducing single-occupancy commuter journeys and harmful emissions
Travel Wise	Ongoing	Relaunch and rebranding Autumn 2005	No outcome to date	New campaign will focus on providing better information to the public on sustainable transport options
School Travel Plans	Ongoing	Target Met	171 school travel plans agreed to date out of 480 schools in Norfolk	A new stretch target of 250 schools travel plans agreed by the end of 2006
Workplace Travel Plans	Ongoing	4 workplace travel plans agreed through section 106 agreements	No outcome to date	1 of these is for the Chapelfield development, which is adjacent to the Grapes Hill AQMA
Alternative Fuels:				
Cleanup Motorvate Powershift	Ongoing	None (see comments)	No outcome to date	Grant programmes ended and are being revised to move to a technology neutral approach, and adjusted to comply with State Aid rules.
Land Use Planning	Ongoing	New Local Transport Plan aims to integrate land use and transport planning in a bid to reduce the need to travel	No outcome to date	
Leading by Example:				
Alternative Fuel Trials	2003 / 2004	Trial completed in summer 2004	County Council will use results to make better use of alternative fuels in its vehicle fleet	
Commuter Plan	Ongoing	New Travel Plan for Norfolk County Council agreed summer 2004	No outcome to date	
Car Sharing	Ongoing	Car sharing mate-match lunch held at County hall	12 car sharing matches made	