King's Lynn and Norfolk Borough Council

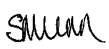
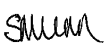
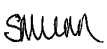
LAQM Progress Report 2013

Bureau Veritas Air Quality

June 2013

Move Forward with Confidence

Document Control Sheet

Issue/Revision	Issue 1	Issue 2	Issue 3
Remarks	Draft	Draft	Final
Date	02/05/2013	18/06/2013	28/06/2013
Submitted to	Alex Grimmer	Alex Grimmer	Alex Grimmer
Prepared by	Samantha Munn	Samantha Munn	Samantha Munn
Signature			
Approved by	Ben Warren	Ben Warren	Ben Warren
Signature			
Project number	7351442	7351442	7351442
File reference	2860	2860	2860

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Bureau Veritas UK Limited
Brandon House
180 Borough High Street
SE1 1LB

Telephone: +44 (0) 207 902 6100
Fax: +44 (0) 207 902 6149
Registered in England 1758622
www.bureauveritas.co.uk

Registered Office
Brandon House
180 Borough High Street
SE1 1 LB

Local Authority Officer	Alex Grimmer
Department	Environmental Health and Housing
Address	King's Court Chapel Street King's Lynn Norfolk PE30 1EX
Telephone	01553 616 421
e-mail	alex.grimmer@west-norfolk.gov.uk
Report Reference number	Annual Progress Report 2013
Date	June 2013

Executive Summary

Part IV of the Environment Act 1995 places a statutory duty on local authorities to review and assess the air quality within their area and take account of Government Guidance when undertaking such work. This Annual Progress Report is a requirement of the Fifth Round of Review and Assessment and is a requirement for all local authorities. The Report has been undertaken in accordance with Technical Guidance LAQM.TG (09) and associated tools (as updated in 2010).

This Annual Progress Report considers all new monitoring data and assesses the data against the Air Quality Strategy (AQS) objectives. It also considers any changes that may have an impact on air quality.

Updated monitoring showed that there were no exceedences of the NO_2 AQS objectives outside of existing AQMAs or where relevant exposure was present. King's Lynn and West Norfolk Council continue to monitor at one location along Hardwick Road, in the area of the new Tesco development. The 2012 monitoring data shows that the annual mean NO_2 concentration continues a decreasing trend. From this data it would appear that the development has not lead to increases in NO_2 concentrations as predicted.

Continuous monitoring for Particulate Matter less than 10µg in aerodynamic diameter (PM_{10}) has shown that the AQS objectives continue to be met at the TEOM monitoring stations. The Stoke Ferry Osiris monitoring location showed exceedences of the annual and the 24-hour mean. King's Lynn and West Norfolk Borough Council should proceed to a Detailed Assessment in this area.

There are three biomass installations identified in the borough for which full data is currently unavailable. It is recommended that King's Lynn and West Norfolk Borough Council continue to seek the relevant information and complete the necessary screening assessment in the next LAQM report.

Proposed actions arising from the Progress Report are as follows:

- Continue NO_2 diffusion tube and continous monitoring in the district to identify future changes in pollutant concentrations;
- Undertake a Detailed Assessment for the Stoke Ferry area with regards to PM_{10};

- Continue to gather emission and stack information for the identified biomass installations to determine their potential impact upon air quality;
- Proceed to a Progress Report in 2014.

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1 Introduction

1.1 Description of Local Authority Area

The Borough of King's Lynn & West Norfolk covers approximately 550 square miles (142,877 hectares) and is essentially rural in nature. The Borough includes the two market towns of King's Lynn and Downham Market, the Victorian coastal town of Hunstanton, and more than one hundred villages of varying sizes. The Borough is located about 100 miles north of London and stretches from the north Norfolk coast, along the eastern side of The Wash, through the Marshland, Fens and Brecks to the borders of Lincolnshire, Cambridgeshire and Suffolk. The Borough is the tenth largest district council area in England and Wales. In 2010, the population of King's Lynn & West Norfolk was estimated at approximately 143,631 (source: ONS).

King's Lynn is an important nodal point, where major transport routes converge, including a trunk road (A47) and three principal roads (A10, A17 and A134); a direct, electrified rail service to London and Cambridge; an extensive system of inland navigable waterways; and sea links to northern and eastern Europe. The town lies some forty miles from the other regional centres of Cambridge, Norwich and Peterborough.

The main source of air pollution in the Borough is road traffic emissions, notably along the A148 (London Road / Gaywood Road / Wootton Road) going through King's Lynn town centre. Other pollution sources, including commercial, industrial and domestic sources, also make a contribution to background pollution concentrations.

Two Air Quality Management Areas (AQMA) have been declared in King's Lynn where exceedences of the annual mean Air Quality Strategy (AQS) objective for nitrogen dioxide (NO_2) were identified, mainly due to traffic congestion.

Another AQMA had previously been declared in 2002 in South Quay, King's Lynn, where the loading of grain onto vessels, highlighted as a potential source of fugitive PM_{10} emissions, contributed to the exceedence of the PM_{10} daily mean AQS objective. However, the South Quay AQMA was revoked in 2006 following the implementation of an Air Quality Action Plan (AQAP) and evidence that PM_{10} levels met the objective.

1.2 Purpose of Progress Report

This report fulfils the requirements of the Local Air Quality Management (LAQM) process as set out in Part IV of the Environment Act (1995), the AQS 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 AQMA and prepare an AQAP setting out the measures it intends to put in place in pursuit of the objectives.

Progress Reports are required in the intervening years between the three-yearly Updating and Screening Assessment reports. Their purpose is to maintain continuity in the LAQM process.

They are not intended to be as detailed as Updating and Screening Assessment Reports, or to require as much effort. However, if the Progress Report identifies the risk of exceedence of an AQS Objective, the Local Authority (LA) should undertake a Detailed Assessment immediately, and not wait until the next round of Review and Assessment.

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 micrograms per cubic metre µg/m^3 (milligrams 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 Objective included in Regulations for the purpose of LAQM in England

Pollutant	Air Quality Objective		Date to be achieved by
	Concentration	Measured as	
Benzene	16.25 µg/m^3	Running annual mean	31.12.2003
	5.00 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 mg/m^3	Running 8-hour mean	31.12.2003
Lead	0.50 µg/m^3	Annual mean	31.12.2004
	0.25 µg/m^3	Annual mean	31.12.2008

Pollutant	Air Quality Objective		Date to be achieved by
	Concentration	Measured as	
Nitrogen dioxide	200 µg/m^3 not to be exceeded more than 18 times a year	1-hour mean	31.12.2005
	40 µg/m^3	Annual mean	31.12.2005
Particulate Matter (PM_{10}) (gravimetric)	50 µg/m^3, not to be exceeded more than 35 times a year	24-hour mean	31.12.2004
	40 µg/m^3	Annual mean	31.12.2004
Sulphur dioxide	350 µg/m^3, not to be exceeded more than 24 times a year	1-hour mean	31.12.2004
	125 µg/m^3, not to be exceeded more than 3 times a year	24-hour mean	31.12.2004
	266 µg/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

Between 1999 and 2003, the Borough Council of King's Lynn & West Norfolk undertook its First Round of Review and Assessment of air quality, which concluded that PM_{10} and NO_2 concentrations were likely to exceed the AQS objectives at a number of locations in King's Lynn. As a result, the Council declared two AQMAs, one in South Quay (for PM_{10}) in April 2002, and another one in Railway Road (for NO_2) in November 2003. The South Quay AQMA was revoked in June 2006 following the effective implementation of an AQAP for the area.

The Second Round of Review and Assessment began with an Updating and Screening Assessment (USA), completed in 2003. The report concluded that there had been no significant changes since the First Round and that it was not necessary to carry out a Detailed Assessment at that time. However, the subsequent Progress Report (2004) recommended proceeding to a Detailed Assessment for NO_2, following new monitored exceedences of the annual mean objective outside the AQMA in King's Lynn. The Detailed Assessment (2005) confirmed that exceedences were likely to occur at several sites outside the AQMA, and as a result, made the recommendation to extend the AQMA to encompass properties along Railway Road, Blackfriars Road and London Road.

The Third Round of Review and Assessment began with the USA, completed in 2006. The report provided an update with respect to air quality issues within the Borough since the

previous round. A number of changes made to the technical guidance for the Review and Assessment process since the Second Round (Technical Guidance LAQM.TG(03)) were taken into account for this assessment. Having considered each pollutant, the USA concluded that the AQS objectives for benzene, 1,3-butadiene, carbon monoxide, lead, PM_{10} and sulphur dioxide were still being met and that no further assessment was required for these pollutants. The report also recommended (following the conclusions of the Detailed Assessment 2005) that monitoring of NO_2 be continued in the Borough to validate the proposal to extend the Railway Road AQMA in King's Lynn.

The Council approved a variation order (February 2007) to extend the AQMA, which now includes all of Railway Road, Austin Street, Blackfriars Road, St James Road and London Road.

Modelling undertaken by a neighbouring Local Authority, Fenland District Council, also predicted potential exceedences of the NO_2 annual mean AQS objective along Elm High Road in Wisbech. The area lies on the border of the Borough of King's Lynn & West Norfolk; therefore, both local authorities deployed additional diffusion tubes in the area to confirm the modelling results.

The Progress Report carried out in 2007 confirmed that NO_2 concentrations were still exceeding the objective at the majority of the monitoring sites in the AQMA; justifying its extension. It also concluded that a Detailed Assessment for NO_2 in Wisbech was not required, as new monitoring results were below the AQS objective. However, new available NO_2 monitoring results showed an exceedence of the objective at the 'Wootton Road 2' diffusion tube in the Gaywood Clock area of King's Lynn. This site is located about 1km east of the extended AQMA in the town centre; therefore, it was recommended that a Detailed Assessment be carried out in this area.

The Detailed Assessment, which also included the Further Assessment of the Railway Road AQMA, was completed in 2008. The report concluded that a new AQMA in the Gaywood Clock area was required, as both updated monitoring data and predicted NO_2 concentrations confirmed that the AQS annual mean objective was likely to be exceeded. The new AQMA was declared in April 2009, for an area encompassing properties at the junction of Wootton Road, Gayton Road and Lynn Road.

The Further Assessment confirmed that the extended Railway Road AQMA in King's Lynn Town Centre was still valid and should remain, as both monitoring and modelling confirmed exceedences of the AQS objective. The source apportionment results showed that cars are

the main contributors with respect to high levels of NO_2 in the AQMA, followed by buses, HGVs and LGVs, while background pollution levels also contribute significantly.

The 2009 USA took into consideration changes to the Technical Guidance LAQM.TG(09) and concluded that although exceedences of NO_2 were still recorded in the Borough, these were confined to the existing AQMAs. Pollutant concentrations outside the AQMAs met the objectives and no Detailed Assessment was required.

The Further Assessment of the Gaywood Clock AQMA was completed in July 2010. The report confirmed the need for the AQMA as both monitoring and modelled concentrations still exceeded the NO_2 annual mean objective.

The 2010 and 2011 Annual Progress Reports concluded that no new Detailed Assessment were required as there were no new exceedences recorded outside the existing AQMAs.

The 2012 Updating and Screening Assessment found that a Detailed Assessment was required in the Page Stair Lane area due to potential exceedences of the annual mean and 24-hour mean with regards to PM_{10}. During 2011 particulate monitoring was completed in this area using an Osiris instrument, an indicative method of monitoring only. The USA also identified a new Tesco development on Hardwick Road, which modelling had predicted to increase NO2 concentrations on Hardwick Road. It was advised that King's Lynn and West Norfolk Borough Council continue to monitor at this location in order to assess the impact of the development.

Figure 1-1 Map of King's Lynn AQMA 1 – Railway Road (Town Centre)

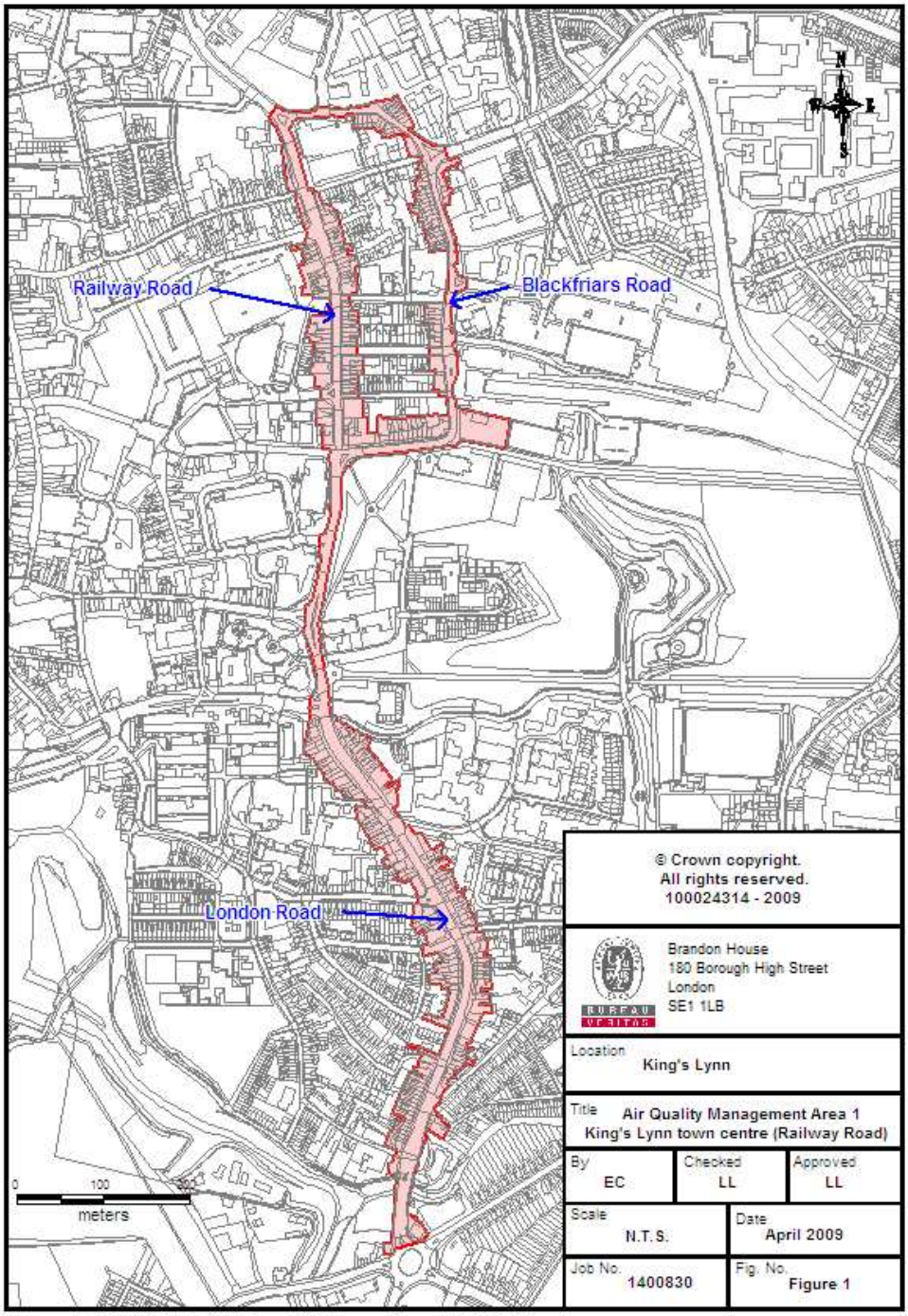
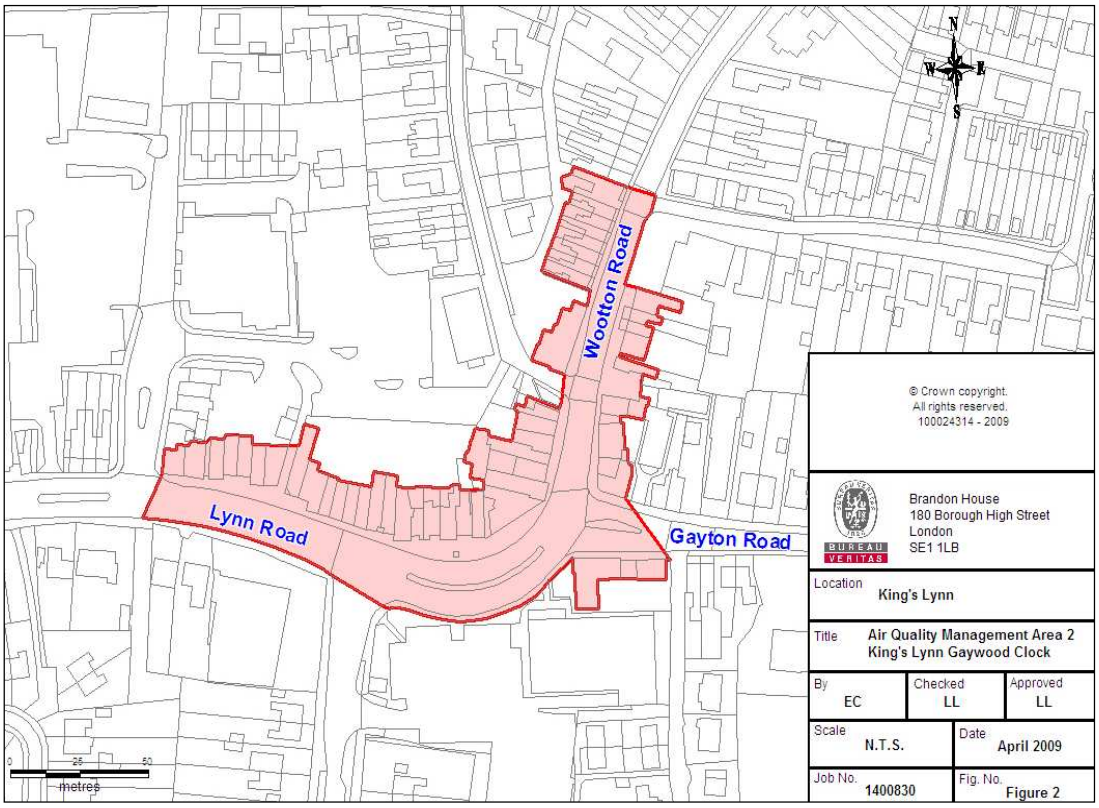


Figure 1-2 Map of King's Lynn AQMA 2 – Gaywood Clock



2 New Monitoring Data

2.1 Summary of Monitoring Undertaken

2.1.1 Automatic Monitoring Sites

King's Lynn and West Norfolk Borough Council undertook continuous monitoring of pollutants using reference methods at three locations during 2012: in Southgates, King's Lynn, in the village of Leziate near a sand quarry site and in Gaywood, King's Lynn. These sites are shown in Figures 2.1 and 2.2.

The Southgates station, which monitors nitrogen dioxide (NO_2) and particulates (PM_{10}) in King's Lynn town centre AQMA comprises a chemiluminescence NO_x / NO_2 analyser and a Tapered Element Oscillating Microbalance (TEOM) PM_{10} analyser. Both analysers have been operational since 2006. In June 2011 a new chemiluminescence NO_x / NO_2 monitor was installed to replace the old instrument, which ceased operation in April 2011.

The Leziate monitoring station was established in July 2009 off Station Road near the sand quarry site entrance. From July 2011 the chemiluminescene NO_x / NO_2 analyser was removed. The station continues to operate with a TEOM PM_{10} analyser.

The Gaywood monitoring station was installed in 2011, however there were installation and power issues; as such the site did not begin full data capture until January 2012. The site monitors NO_x / NO_2 using a chemiluminescence analyser.

In 2012 the Council also monitored particulate levels based on indicative method of Osiris dust and particle analysers across the Borough. Instruments are installed in the village of Stoke Ferry near an industrial site, at Page Stair Lane to monitor dust from King's Lynn Docks and at Leziate near a sandy quarry site.

Further details of these monitoring stations are provided in Table 2.1.

Figure 2-1 Map of continuous Monitoring Sites

Table 2-1 Details of Automatic Monitoring Sites

Site ID	Site Type	X OS Grid Reference	Y OS Grid Reference	Inlet Height (m)	Pollutants Monitored	In AQMA?	Monitoring Technique	Relevant Exposure?	Distance to Kerb of Nearest Road (m)	Does this Location Represent Worst-Case Exposure?
King's Lynn Southgates	Roadside	562227	319198	1.70	NO_2, PM_{10}	Y	Chemiluminescence, TEOM	N	5m	No
Leziate	Industrial	567090	318257	3.50	NO_2, PM_{10} (TSP, PM_{10}, $PM_{2.5}$, PM_1)	N	Chemiluminescence,TEOM and Osiris	Y – 25m	41m	No
Gaywood, King's Lynn	Roadside	563443	320482	1.70	NO_2	Y	Chemiluminescence	Y – 5m	1m	Yes
Furlong Road, Stoke Ferry	Industrial	570339	300083	3.50	TSP, PM_{10}, $PM_{2.5}$, PM_1	N	Osiris	Yes – 5m	1m	Yes
Page Stair Lane	Industrial	561527	320437	3.50	TSP, PM_{10}, $PM_{2.5}$, PM_1	N	Osiris	Yes – 5m	3.3m	Yes

Heights are estimates

2.1.2 Non-Automatic Monitoring Sites

In 2012 the Council monitored NO_2 at 64 sites in the Borough using passive diffusion tubes. The vast majority of the monitoring sites are located in King's Lynn town centre, including a set of triplicate tubes co-located with the continuous monitoring analyser in Southgates.

King's Lynn and West Norfolk Borough Council continue to monitor at the below locations in response to a waste incinerator application at the Willows, Saddlebow Industrial Area.

- Ferry Square, West Lynn;
- Main Road, West Winch;
- Saddlebow Caravan Park, King's Lynn;
- Sydney Terrace;
- Burnley Road;
- Mayfield House Lynn Road, Saddlebow; and
- New Farm House, High Road, Saddlebow

In 2012 one new site was added in July 2012;

- 75 - The Swan (2), Gayton Road

One monitoring site was discontinued in July 2012;

- 17 – Nora 1

The NO_2 diffusion tube data along Elm High Road, Wisbech over the last few years has consistently shown that NO_2 concentrations are below the annual mean AQS objective, therefore monitoring at this location will be discontinued and relocated to other locations.

There are 27 diffusion tube sites located in the town centre AQMA, and 6 other sites within the Gaywood Clock AQMA.

Diffusion tubes in 2012 were prepared and analysed by Gradko International Limited. The tube preparation method is 20% TEA in water. Gradko International participates in the Workplace Analysis Scheme for Proficiency (WASP) for NO_2 diffusion tube analysis. This provides strict performance criteria for participating laboratories to meet, thereby ensuring NO_2 concentrations reported are of a high calibre. In WASP data rounds 118 through to 119 (January to December 2012) Gradko International have scored 100%. The percentage score reflects the results deemed to be satisfactory based upon the z-score of $< \pm 2$.

The July tube results have been removed from the dataset based on advice from the laboratory and National Physical Laboratory (NPL). All tube dispatched for the July exposure period are suspect and therefore should not be used in any assessments.

Data have been corrected using a bias adjustment factor, which is an estimate of the difference between diffusion tube concentrations and continuous monitoring, the latter assumed to be a more accurate method of monitoring. The technical guidance LAQM.TG (09) provides guidance with regard to the application of a bias adjustment factor to correct diffusion tubes. Triplicate co-location studies can be used to determine a local bias factor based on the comparison of diffusion tube results with data from NO_x / NO_2 continuous analysers. Alternatively, the national database of diffusion tube co-location surveys provides bias factors for the relevant laboratory and preparation method.

There are triplicate co-located tubes in the King's Lynn and West Norfolk Borough Council area. Data capture for the continuous monitor located at Southgates was 93% for the year. Diffusion tube precision and data capture was good for the year overall. The local bias-adjustment factor is 0.84, based on 9 periods.

The national bias adjustment factor is 0.97. Contained in the appendix are the results for the diffusion tubes if this bias adjustment factor had been used.

For previous data, years 2008 to 2011, the bias adjustment factors have been taken from the Council's previous LAQM annual reports. The factors used were 0.88 (2008), 0.97 (2009), 0.88 (2010) and 0.89 (2011).

The details of the NO_2 monitoring network are shown in table 2.2 and Figure 2.3 through to Figure 2.5.

Figure 2-2 Map of Non-Automatic Monitoring Sites. King's Lynn

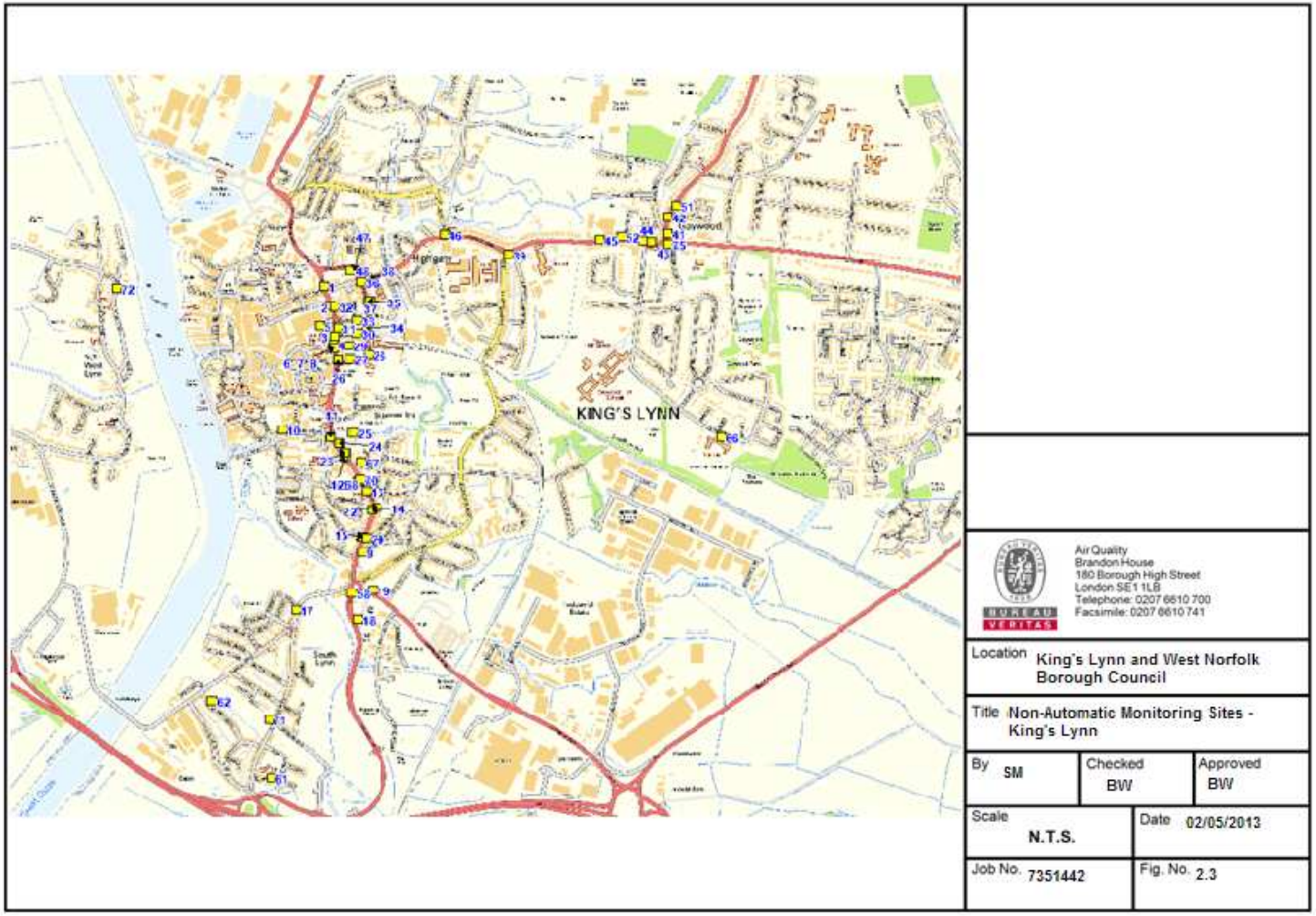


Figure 2-3 Map of Non-Automatic Monitoring Sites Saddlebow and West Winch

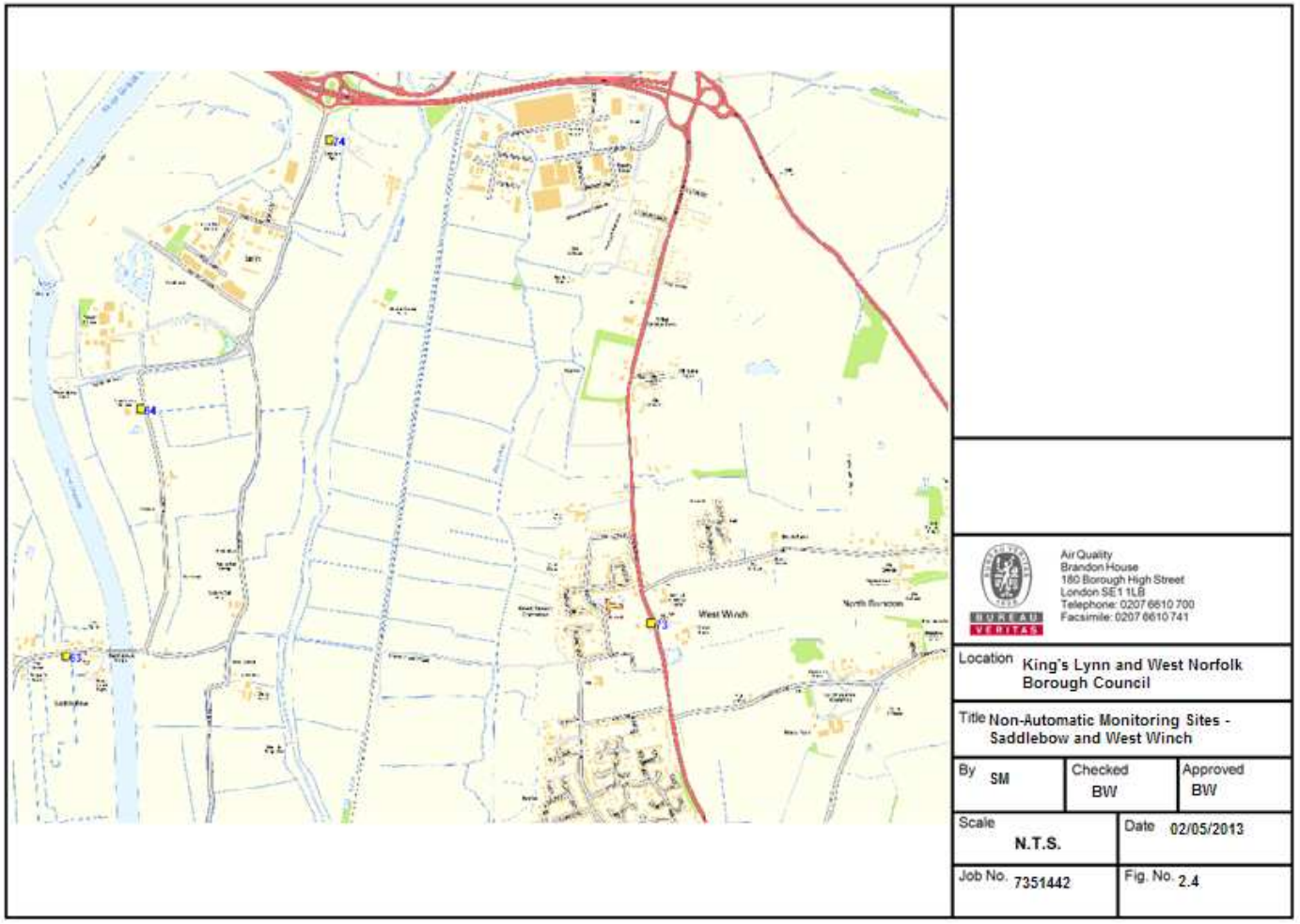


Figure 2-4 Map of Non-Automatic Monitoring Site Wisbech

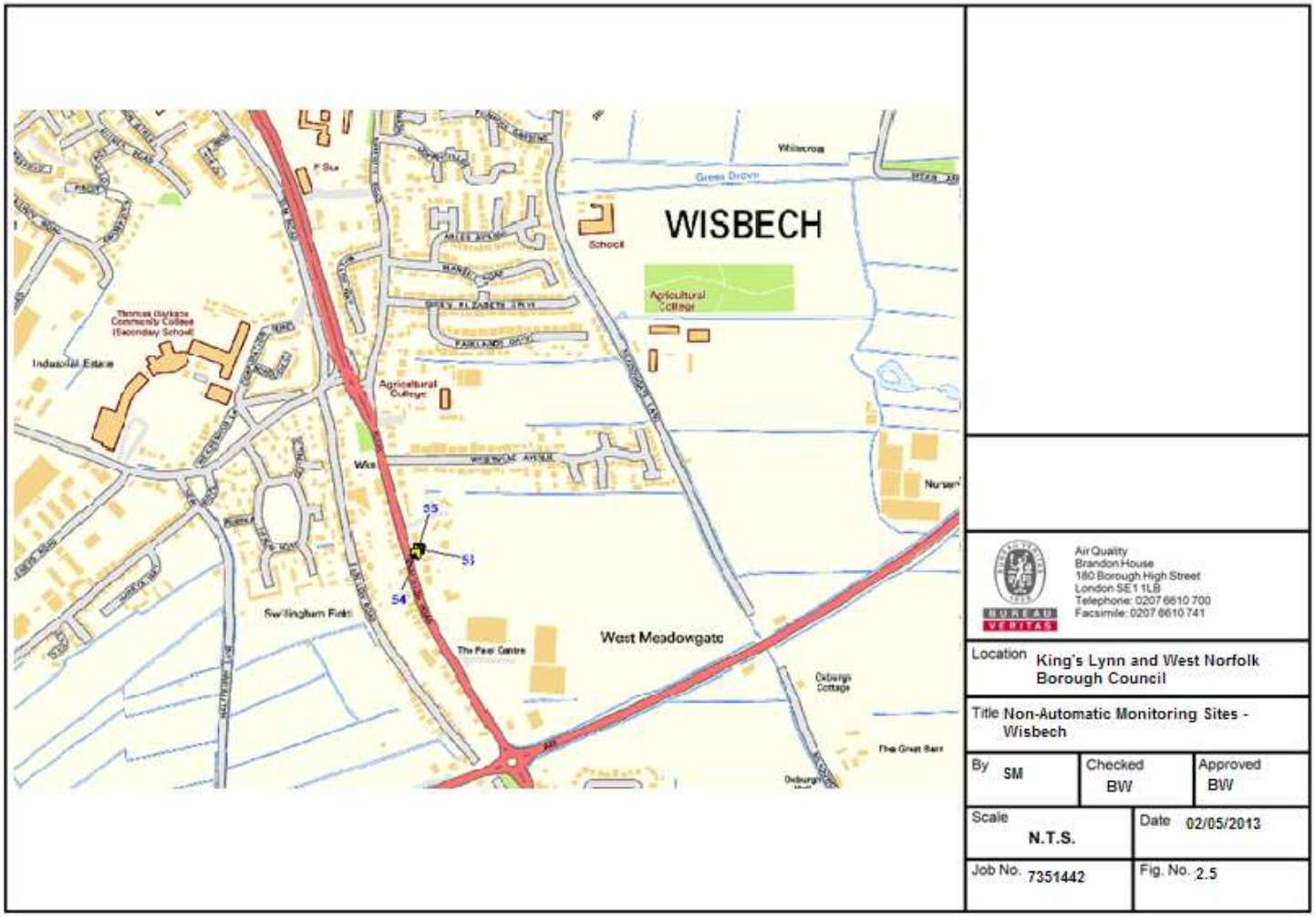


Table 2-2 Details of Non- Automatic Monitoring Sites

Site Name	Site Type	X OS Grid Reference	Y OS Grid Reference	Site Height (m)	Pollutants Monitored	In AQMA?	Is Monitoring Co-located with a Continuous Analyser (Y/N)	Relevant Exposure?	Distance to Kerb of Nearest Road (m)	Does this Location Represent Worst-Case Exposure?
1	Kerbside	562073	320304	2.50	NO_2	Y – Town Centre	N	Y - 3m	2m	Y
2	Roadside	562100	320222	2.40	NO_2	Y – Town Centre	N	Y - 0m	2m	Y
3	Roadside	562117	320095	2.40	NO_2	Y – Town Centre	N	Y - 0m	1.5m	Y
4	Kerbside	562115	320062	2.40	NO_2	Y – Town Centre	N	Y - 2.5m	1m	Y
5	Roadside (Bus Station)	562055	320137	2.20	NO_2	N	N	N	N/A	Y
6,7,8	Roadside	562113	320043	3.20	NO_2	Y – Town Centre	Y	No but property façade 4m from kerb further north	5m	Y
9	Roadside	562227	319198	2.50	NO_2	N	N	No but property façade 4m from kerb in same street	4m	Y
10	Roadside	561900	319707	1.40	NO_2	Y	N	Y - 2.5m	3m	Y

Site Name	Site Type	X OS Grid Reference	Y OS Grid Reference	Site Height (m)	Pollutants Monitored	In AQMA?	Is Monitoring Co-located with a Continuous Analyser (Y/N)	Relevant Exposure?	Distance to Kerb of Nearest Road (m)	Does this Location Represent Worst-Case Exposure?
11	Roadside	562101	319679	2.20	NO_2	Y – Town Centre	N	Y - 0m	3m	Y
12	Roadside	562154	319594	2.10	NO_2	Y – Town Centre	N	Y - 1m	3m	Y
13	Roadside	562242	319452	2.20	NO_2	Y – Town Centre	N	Y - 0m	4.5m	Y
14	Roadside	562264	319375	2.20	NO_2	Y – Town Centre	N	Y - 0.5m	4m	Y
15	Roadside	562226	319263	2.40	NO_2	Y – Town Centre	N	Y - 1m	0.5m	Y
17	Roadside	561958	318963	2.40	NO_2	N	N	Y - 0m	11m	Y
18	Roadside	562209	318924	1.60	NO_2	N	N	Y - 0m	7m	Y
19	Roadside	562266	319043	1.50	NO_2	N	N	Y - 0m	6m	Y
20	Kerbside	562244	319261	2.20	NO_2	Y – Town Centre	N	Y - 0m	3.5m	Y
22	Roadside	562285	319386	1.30	NO_2	Y – Town Centre	N	Y - 0m	5m	Y
23	Roadside	562162	319614	2.10	NO_2	Y – Town Centre	N	Y - 0m	4.5m	Y

Site Name	Site Type	X OS Grid Reference	Y OS Grid Reference	Site Height (m)	Pollutants Monitored	In AQMA?	Is Monitoring Co-located with a Continuous Analyser (Y/N)	Relevant Exposure?	Distance to Kerb of Nearest Road (m)	Does this Location Represent Worst-Case Exposure?
24	Roadside	562136	319651	2.20	NO_2	Y – Town Centre	N	Y - 0m	5.5m	Y
25	Urban Background	562191	319695	1.70	NO_2	N	N	Y - 0m	75m	Y
26	Roadside	562131	319996	2.30	NO_2	Y – Town Centre	N	Y - 0m	2m	Y
27	Roadside	562178	319999	2.10	NO_2	Y – Town Centre	N	Y - 3m	2m	Y
28	Roadside	562253	320016	2.60	NO_2	Y – Town Centre	N	Y - 0m	1.5m	Y
29	Kerbside	562175	320055	1.60	NO_2	N	N	Y - 2.5m	1m	Y
30	Kerbside	562204	320108	2.40	NO_2	N	N	Y - 2.5m	1m	Y
31	Kerbside	562129	320132	2.30	NO_2	Y – Town Centre	N	Y - 0m	2m	Y
32	Roadside	562119	320216	2.40	NO_2	Y – Town Centre	N	Y - 0m	2m	Y
33	Kerbside	562203	320159	2.40	NO_2	N	N	Y - 2.5m	0.5m	Y
34	Roadside	562244	320129	2.40	NO_2	Y – Town Centre	N	Y - 0m	2.5m	Y
35	Roadside	562248	320239	2.30	NO_2	Y – Town Centre	N	Y - 3m	1.5m	Y

Site Name	Site Type	X OS Grid Reference	Y OS Grid Reference	Site Height (m)	Pollutants Monitored	In AQMA?	Is Monitoring Co-located with a Continuous Analyser (Y/N)	Relevant Exposure?	Distance to Kerb of Nearest Road (m)	Does this Location Represent Worst-Case Exposure?
36	Roadside	562219	320319	2.20	NO_2	Y – Town Centre	N	Y - 0m	2m	Y
37	Roadside	562257	320243	2.50	NO_2	Y – Town Centre	N	No	2m	Y
38	Roadside	562257	320323	2.40	NO_2	Y – Town Centre	N	Y - 0m	2.5m	Y
39	Roadside	562822	320427	5.00	NO_2	N	N	Y - 0m	7m	Y
40	Roadside	563480	320470	2.50	NO_2	Y – Gaywood Clock	N	Y - 0m	2m	Y
41	Roadside	563478	320515	3.40	NO_2	Y – Gaywood Clock	N	Y - 0m	2m	Y
42	Roadside	563480	320582	1.70	NO_2	Y – Gaywood Clock	N	Y - 0m	3m	Y
43	Roadside	563412	320477	3.40	NO_2	Y – Gaywood Clock	N	Y - 0m	5m	Y

Site Name	Site Type	X OS Grid Reference	Y OS Grid Reference	Site Height (m)	Pollutants Monitored	In AQMA?	Is Monitoring Co-located with a Continuous Analyser (Y/N)	Relevant Exposure?	Distance to Kerb of Nearest Road (m)	Does this Location Represent Worst-Case Exposure?
44	Roadside	563377	320484	3.40	NO_2	Y – Gaywood Clock	N	Y - 0m	2m	Y
45	Roadside	563202	320488	2.20	NO_2	N	N	Y - 0m	4.5m	Y
46	Roadside	562565	320509	2.09	NO_2	N	N	Y - 0m	6.5m	Y
47	Roadside	562193	320369	1.70	NO_2	Y – Town Centre	N	Y - 0.5m	1m	Y
48	Roadside	562180	320365	2.60	NO_2	Y – Town Centre	N	Y - 0m	2m	Y
51	Roadside	563515	320628	1.80	NO_2	N	N	Y - 6m	1.5m	Y
52	Roadside	563288	320499	1.60	NO_2	N	N	Y - 5.5m	1m	Y
53	Roadside	546947	308215	1.60	NO_2	N	N	Y - 0m	2m	Y
54	Roadside	546940	308207	1.60	NO_2	N	N	Y - 0m	2m	Y
55	Roadside	546945	308216	1.40	NO_2	N	N	Y - 0m	2m	Y
58	Roadside	562186	319031	2.50	NO_2	N	N	Y - 18m	2m	Y
61	Roadside	561854	318272	1.55	NO_2	N	N	Y – 0m	3.5m	Y
62	Roadside	561615	318591	1.55	NO_2	N	N	Y – 0m	7m	Y
63	Roadside	560593	315712	1.70	NO_2	N	N	Y – 0m	15m	N
64	Roadside	560917	316766	1.70	NO_2	N	N	Y – 0m	22m	N
66	Urban Background	563699	319679	2.40	NO_2	N	N	Y - 0m	N/A	Y

Site Name	Site Type	X OS Grid Reference	Y OS Grid Reference	Site Height (m)	Pollutants Monitored	In AQMA?	Is Monitoring Co-located with a Continuous Analyser (Y/N)	Relevant Exposure?	Distance to Kerb of Nearest Road (m)	Does this Location Represent Worst-Case Exposure?
67	Urban Background	562222	319576	2.30	NO_2	N	N	Y - 0m	N/A	Y
68	Urban Background	562208	319493	1.60	NO_2	N	N	Y - 0m	N/A	Y
69	Urban Background	562215	319502	2.20	NO_2	N	N	Y - 0m	N/A	Y
70	Urban Background	562215	319502	2.40	NO_2	N	N	Y - 0m	N/A	Y
71	Urban Background	561846	318514	2.20	NO_2	N	N	Y - 0m	N/A	Y
72	Roadside	561223	320295	2.20	NO_2	N	N	Y – 0.5m	1.5m	Y
73	Urban Background	563161	315848	1.70	NO_2	N	N	Y – 10m	11m	Y
74	Roadside	561754	317910	2.20	NO_2	N	N	Y – 5m	1m	Y
75	Roadside	563480	320470	2.80	NO_2	Y – Gaywood Clock	N	Y - 0m	2m	Y

Heights are estimates

2.2 Comparison of Monitoring Results with Air Quality Objectives

2.2.1 Nitrogen Dioxide

There are two Air Quality Objectives for NO_2, namely:

- the annual mean of 40µg/m^3, and
- the 1-hour mean of 200µg/m^3 not to be exceeded more than 18 times a year.

Automatic Monitoring Data

The Council monitored NO_2 at two locations during 2012 the roadside Southgates monitoring station in King's Lynn and the Gaywood monitoring station. Data capture was good during 2012 at both sites and as such no annualisation has been required.

The monitoring data can be seen in Table 2.3 and 2.4 below.

Results for 2012 indicate that both the annual mean objective and the 1-hour objective were met at both monitoring locations.

Figure 2.5 shows the trend in NO_2 concentration from 2008 through to 2012 at the Southgates monitoring location. This shows that concentrations peaked in 2009, following this, the annual mean decreased in 2010 and 2011, before increasing once again in 2012.

Table 2-3 Results of Automatic Monitoring for NO_2: Comparison with Annual Mean Objective

Site ID	Site Type	Within AQMA?	Valid Data Capture for Monitoring Period %	Valid Data Capture 2012 %	Annual Mean Concentration (µg/m^3)				
					2008	2009	2010	2011	2012
King's Lynn Southgates	Roadside	Y	93.1	93.1	27	30	27	23	25
Gaywood, King's Lynn	Roadside	Y	91.6	91.6	-	-	-	-	33

Figure 2-5 Trends in Annual Mean NO_2 Concentrations Measured at Automatic Monitoring Sites

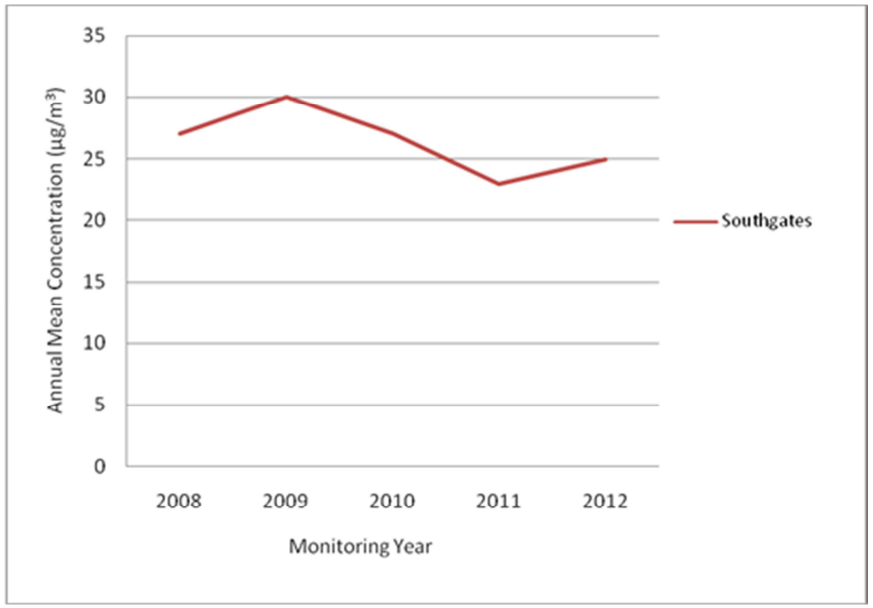


Figure 2.5 shows the trend in annual mean concentration at the Southgates monitoring location. This shows that NO_2 concentrations peaked in 2009, before decreasing in 2010 and 2011. The 2012 monitoring results show that the annual mean concentration has increased.

Table 2-4 Results of Automatic Monitoring for NO_2: Comparison with 1-hour Mean Objective

Site ID	Site Type	Within AQMA?	Valid Data Capture for Monitoring Period %	Valid Data Capture 2012 %	Number of Hourly Means > 200µg/m^3				
					2008	2009	2010	2011	2012
King's Lynn Southgates	Roadside	Y	93.1	93.1	0	0	0	0	0
Gaywood, King's Lynn	Roadside	Y	91.6	91.6	-	-	-	-	0

Diffusion Tube Monitoring Data

The NO_2 diffusion tube data are summarised in Table 2.5. The full dataset (monthly mean values) are included in Appendix A.

Data capture for 2012 was good, with annualisation required for five sites only. Full details regarding the annualisation can be found in Appendix A.

For the 2012 data set there were two sites where the annual mean AQS objective was exceeded. There are a further six sites which are close to the annual mean objective, and if the national bias adjustment factor is used, these sites would have shown an exceedence.

One of the sites showing to be exceeding was located within the existing Town Centre AQMA.

- Railway Road 4.

Those sites which are close to the annual mean are all located within the existing Town Centre AQMA

- Railway Road 1;
- Railway Road 5;
- London Road 1;
- Southgates;
- Railway Road 7; and
- Railway Road 2.

Of those tubes which have shown an exceedence, the Railway Road 4 site has shown exceedences in previous years, with the concentration in 2012 a reduction on previous year's results.

Site 5, Bus Station 1 was the only site to exceed the annual mean objective outside of an existing AQMA. This site is positioned to give an indication of the hourly objective at this location, as there is relevant exposure with regards to this objective as people may spend up to one hour at the bus station. There is no relevant exposure with regards to the annual mean. With respect to the hourly NO_2 objective, there could be a potential risk of exceedence where the annual mean concentration is greater than 60µg/m^3. From the 2012 annual mean result of 40.9 µg/m^3, it is unlikely that the hourly mean objective will be exceeded at this site.

The 2012 Updating and Screening Assessment identified that there was the potential for increases in NO_2 emissions as per ADMS Roads Modelling in relation to the Tesco Store development on Hardwick Road. King's Lynn and West Norfolk Borough Council have undertaken monitoring on Hardwick Road (Site 18) at this location, both before and following the development of the store. The diffusion tube has shown a continual decrease in annual mean concentrations since 2010, with the result for 2012 being the lowest over a five year period.

Table 2-5 Results of NO_2 Diffusion Tubes 2012

Site ID	Location	Site Type	Within AQMA?	Triplicate or Co-located Tube	Full Calendar Year Data Capture 2012 (Number of Months)	2012 Annual Mean Concentration (µg/m^3) - Bias Adjustment factor = 0.84
1	Railway Road 1	Kerbside	Y – Town Centre	N	9	38.2
2	Railway Road 4	Roadside	Y – Town Centre	N	10	**42.6**
3	Railway Road 5	Roadside	Y – Town Centre	N	8	38.3
4	Railway Road 6	Kerbside	Y – Town Centre	N	10	34.5
5	Bus Station 1	Roadside (Bus Station)	N	N	11	**40.9**
6,7,8	Southgates Monitoring Station	Roadside	Y – Town Centre	Y	11	24.2
9	Mill Fleet 1	Roadside	N	N	8	19.9
10	London Road 1	Roadside	Y – Town Centre	N	11	36.5
11	London Road 2	Roadside	Y – Town Centre	N	11	28.4
12	London Road 3	Roadside	Y – Town Centre	N	10	31.3
13	London Road 4	Roadside	Y – Town Centre	N	11	30.1

Site ID	Location	Site Type	Within AQMA?	Triplicate or Co-located Tube	Full Calendar Year Data Capture 2012 (Number of Months)	2012 Annual Mean Concentration (µg/m^3) - Bias Adjustment factor = 0.84
14	London Road 5	Roadside	Y – Town Centre	N	11	34.9
15	Southgates	Roadside	Y – Town Centre	N	11	35.4
17	Nora 1	Roadside	N	N	5	24.3
18	Hardwick Rd	Roadside	N	N	11	25.4
19	Vancover Avenue 1	Roadside	N	N	11	24.0
20	London Road 10	Kerbside	Y – Town Centre	N	11	27.8
22	London Road 6	Roadside	Y – Town Centre	N	10	30.6
23	London Road 7	Roadside	Y – Town Centre	N	10	31.9
24	London Road 8	Roadside	Y – Town Centre	N	11	30.2
25	The Walks	Urban Background	N	N	11	17.0
26	Railway Road 7	Roadside	Y – Town Centre	N	10	35.2
27	St John's Terrace	Roadside	Y – Town Centre	N	10	29.6

Site ID	Location	Site Type	Within AQMA?	Triplicate or Co-located Tube	Full Calendar Year Data Capture 2012 (Number of Months)	2012 Annual Mean Concentration (µg/m^3) - Bias Adjustment factor = 0.84
28	St John's Terrace/Blackfriar's	Roadside	Y – Town Centre	N	10	27.8
29	Waterloo Street	Kerbside	N	N	11	20.7
30	Portland Street	Kerbside	N	N	10	22.0
31	Railway Road 2	Kerbside	Y – Town Centre	N	9	34.7
32	Railway Road 3	Roadside	Y – Town Centre	N	10	29.1
33	Wellsley Street	Kerbside	N	N	9	26.7
34	Blackfriars 2	Roadside	Y – Town Centre	N	11	30.4
35	Blackfriars 1	Roadside	Y – Town Centre	N	11	28.7
36	Norfolk Street	Roadside	Y – Town Centre	N	11	29.6
37	Blackfriars 3	Roadside	Y – Town Centre	N	10	27.4
38	Littleport Street	Roadside	Y – Town Centre	N	10	33.8
39	Gaywood Road 2	Roadside	N	N	11	24.6

Site ID	Location	Site Type	Within AQMA?	Triplicate or Co-located Tube	Full Calendar Year Data Capture 2012 (Number of Months)	2012 Annual Mean Concentration (µg/m^3) - Bias Adjustment factor = 0.84
40	The Swan Gayton Road	Roadside	Y – Gaywood Clock	Y – Duplicate Tube	11	32.2
41	Wootton Road 2	Roadside	Y – Gaywood Clock	N	9	31.8
42	Wootton Road 1	Roadside	Y – Gaywood Clock	N	11	30.6
43	Lynn Road 1	Roadside	Y – Gaywood Clock	N	11	29.2
44	Lynn Road 2	Roadside	Y – Gaywood Clock	N	11	32.5
45	Gaywood Road 3	Roadside	N	N	10	28.4
46	Gaywood Road 1	Roadside	N	N	11	24.1
47	Austin Street 1	Roadside	Y – Town Centre	N	11	34.1
48	Austin Street 2	Roadside	Y – Town Centre	N	11	29.4
51	Wootton Road 3	Roadside	N	N	11	19.0

Site ID	Location	Site Type	Within AQMA?	Triplicate or Co-located Tube	Full Calendar Year Data Capture 2012 (Number of Months)	2012 Annual Mean Concentration (µg/m^3) - Bias Adjustment factor = 0.84
52	Lynn Road 3	Roadside	N	N	11	28.6
53	Wisbech Rd Elm 3	Roadside	N	N	11	21.7
54	Wisbech Rd Elm 4	Roadside	N	N	11	21.6
55	Wisbech Rd Elm 5	Roadside	N	N	11	18.8
58	NORR 2	Roadside	N	N	10	23.9
61	9 Sydney Terrace	Roadside	N	N	10	15.8
62	5 Burnley Road	Roadside	N	N	10	18.1
63	Mayfield House, Lynn Road	Roadside	N	N	11	10.6
64	New Farm House, High Road, Saddlebow	Roadside	N	N	11	10.8
66	Highgate Primary School	Urban Background	N	N	11	21.9
67	Greyfriars 2 Primary School	Urban Background	N	N	11	17.5
68	Nursery School	Urban Background	N	N	10	24.4
69	Whitefriars 1 Primary School	Urban Background	N	N	10	15.0
70	Whitefriars 2 Primary School	Urban Background	N	N	10	12.1
71	St Michael's Primary School	Urban Background	N	N	6	17.5
72	Ferry Square West Lynn	Roadside	N	N	9	12.3
73	Main Road, West Winch	Urban Background	N	N	10	22.8

Site ID	Location	Site Type	Within AQMA?	Triplicate or Co-located Tube	Full Calendar Year Data Capture 2012 (Number of Months)	2012 Annual Mean Concentration (µg/m^3) - Bias Adjustment factor = 0.84
74	Saddlebow Caravan Park, King's Lynn	Roadside	N	N	11	15.0
75	The Swan (2) Gayton Road	Roadside	Y	Y – Duplicate Tube	5	30.1

The below table provides information on the site which showed an exceedence of the annual mean in Table 2.5. The site has been distance corrected to the nearest relevant exposure façade.

Table 2-6 Fall-off with Distance Correction of Sites Exceeding the NO_2 Annual Mean Objective

Site ID	Distance from Measurement to Kerbside (m)	Distance from Receptor to Kerb (m)	Bias Adjusted Annual Mean (µg/m^3)	Distance Corrected Annual Mean (µg/m^3)
2	2	2	**42.6**	**42.6**

Table 2-7 Results of NO_2 Diffusion Tubes (2008 to 2012)

Site ID	Site Type	Within AQMA?	Annual Mean Concentration (µg/m^3) - Adjusted for Bias				
			2008 (Bias Adjustment Factor = 0.76)	2009 (Bias Adjustment Factor = 0.83)	2010 (Bias Adjustment Factor = 0.89)	2011 (Bias Adjustment Factor = 0.70)	2012 (Bias Adjustment Factor = 0.84)
1	Kerbside	Y – Town Centre	**44.4**	**46.7**	37.4	35.7	38.2
2	Roadside	Y – Town Centre	**51.5**	**56.6**	**46.8**	**50.3**	**42.6**
3	Roadside	Y – Town Centre	**46.8**	**53.1**	**45.6**	**45.4**	38.3
4	Kerbside	Y – Town Centre	37.5	**41.1**	38.3	36.9	34.5
5	Roadside (Bus Station)	N	**40.0**	**41.6**	38.1	**42.5**	**40.9**
6,7,8	Roadside	Y – Town Centre	28.9	29.5	27.1	25.2	24.2
9	Roadside	N	23.4	24.4	24.6	22.3	19.9
10	Roadside	Y	**41.1**	**45.8**	**40.0**	**42.1**	36.5
11	Roadside	Y – Town Centre	31.6	34.6	31.9	30.6	28.4
12	Roadside	Y – Town Centre	38.5	39.6	33.5	33.9	31.3
13	Roadside	Y – Town Centre	36.0	38.5	32.7	32.0	30.1

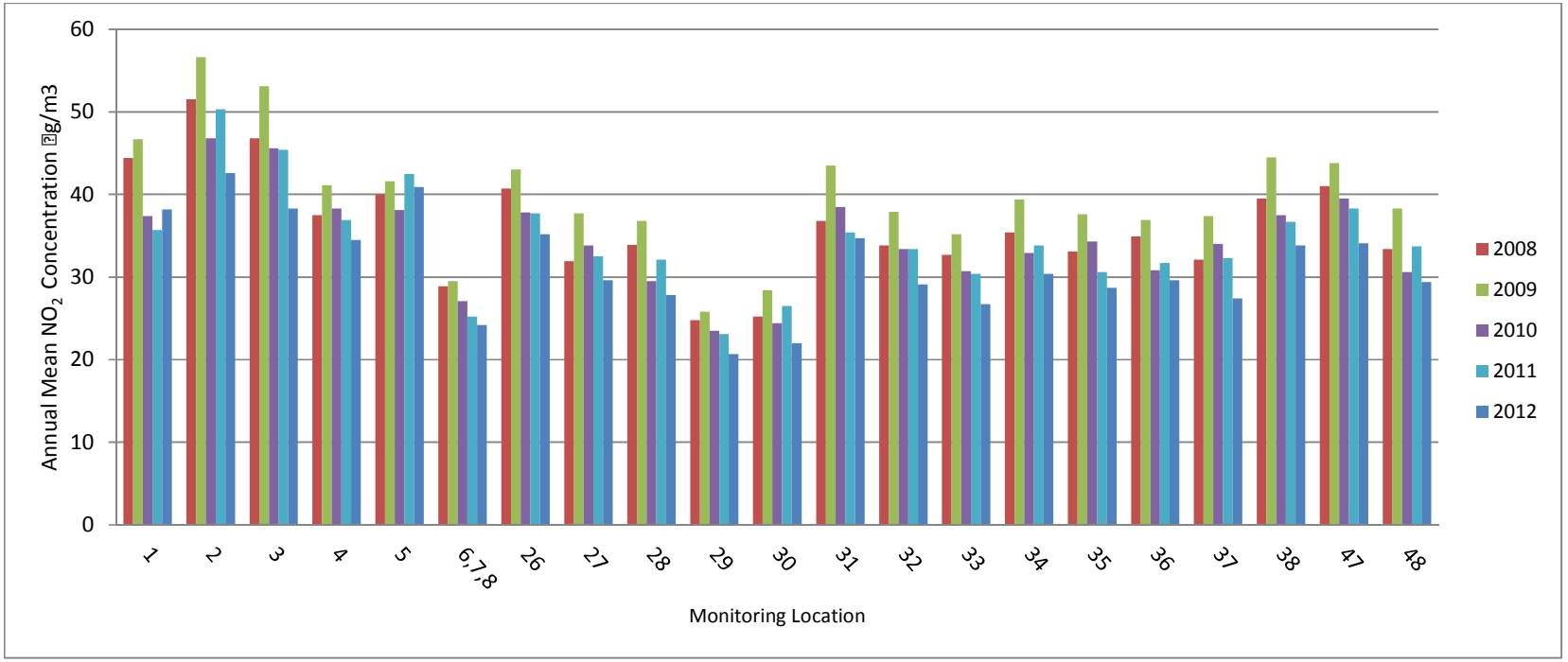
Site ID	Site Type	Within AQMA?	Annual Mean Concentration (µg/m^3) - Adjusted for Bias				
			2008 (Bias Adjustment Factor = 0.76)	2009 (Bias Adjustment Factor = 0.83)	2010 (Bias Adjustment Factor = 0.89)	2011 (Bias Adjustment Factor = 0.70)	2012 (Bias Adjustment Factor = 0.84)
14	Roadside	Y – Town Centre	39.1	37.5	37.5	34.3	34.9
15	Roadside	Y – Town Centre	**42.1**	**44.3**	**43.8**	36.7	35.4
17	Roadside	N	20.3	21.7	25.4	27.1	24.3
18	Roadside	N	30.0	31.5	28.4	28.2	25.4
19	Roadside	N	24.6	29.0	26.3	25.3	24.0
20	Kerbside	Y – Town Centre	32.2	36.2	33.7	30.6	27.8
22	Roadside	Y – Town Centre	37.2	38.8	38.6	34.7	30.6
23	Roadside	Y – Town Centre	35.5	35.9	39.0	34.3	31.9
24	Roadside	Y – Town Centre	32.2	36.6	34.1	31.8	30.2
25	Urban Background	N	18.8	20.1	17.9	17.3	17.0
26	Roadside	Y – Town Centre	**40.7**	**43.0**	37.8	37.7	35.2
27	Roadside	Y – Town Centre	31.9	37.7	33.8	32.5	29.6
28	Roadside	Y – Town Centre	33.9	36.8	29.5	32.1	27.8

Site ID	Site Type	Within AQMA?	Annual Mean Concentration (µg/m^3) - Adjusted for Bias				
			2008 (Bias Adjustment Factor = 0.76)	2009 (Bias Adjustment Factor = 0.83)	2010 (Bias Adjustment Factor = 0.89)	2011 (Bias Adjustment Factor = 0.70)	2012 (Bias Adjustment Factor = 0.84)
29	Kerbside	N	24.8	25.8	23.5	23.1	20.7
30	Kerbside	N	25.2	28.4	24.4	26.5	22.0
31	Kerbside	Y – Town Centre	36.8	**43.5**	38.5	35.4	34.7
32	Roadside	Y – Town Centre	33.8	37.9	33.4	33.4	29.1
33	Kerbside	N	32.7	35.2	30.7	30.4	26.7
34	Roadside	Y – Town Centre	35.4	39.4	32.9	33.8	30.4
35	Roadside	Y – Town Centre	33.1	37.6	34.3	30.6	28.7
36	Roadside	Y – Town Centre	34.9	36.9	30.8	31.7	29.6
37	Roadside	Y – Town Centre	32.1	37.4	34.0	32.3	27.4
38	Roadside	Y – Town Centre	39.5	**44.5**	37.5	36.7	33.8
39	Roadside	N	27.8	31.5	29.0	28.9	24.6
40	Roadside	Y – Gaywood Clock	36.6	39.0	33.7	35.7	32.2

Site ID	Site Type	Within AQMA?	Annual Mean Concentration (µg/m^3) - Adjusted for Bias				
			2008 (Bias Adjustment Factor = 0.76)	2009 (Bias Adjustment Factor = 0.83)	2010 (Bias Adjustment Factor = 0.89)	2011 (Bias Adjustment Factor = 0.70)	2012 (Bias Adjustment Factor = 0.84)
41	Roadside	Y – Gaywood Clock	**40.4**	**45.1**	**42.4**	38.8	31.8
42	Roadside	Y – Gaywood Clock	31.6	35.4	31.2	30.6	30.6
43	Roadside	Y – Gaywood Clock	30.0	32.7	32.0	29.4	29.2
44	Roadside	Y – Gaywood Clock	34.1	38.6	35.8	35.5	32.5
45	Roadside	N	30.8	33.3	34.4	31.5	28.4
46	Roadside	N	28.2	30.4	28.7	27.3	24.1
47	Roadside	Y – Town Centre	**41.0**	**43.8**	39.5	38.3	34.1
48	Roadside	Y – Town Centre	33.4	38.3	30.6	33.7	29.4
51	Roadside	N	21.4	23.6	20.5	20.7	19.0
52	Roadside	N	30.7	37.0	32.1	29.6	28.6
53	Roadside	N	26.9	31.1	28.7	26.9	21.7
54	Roadside	N	23.8	28.2	25.1	23.3	21.6

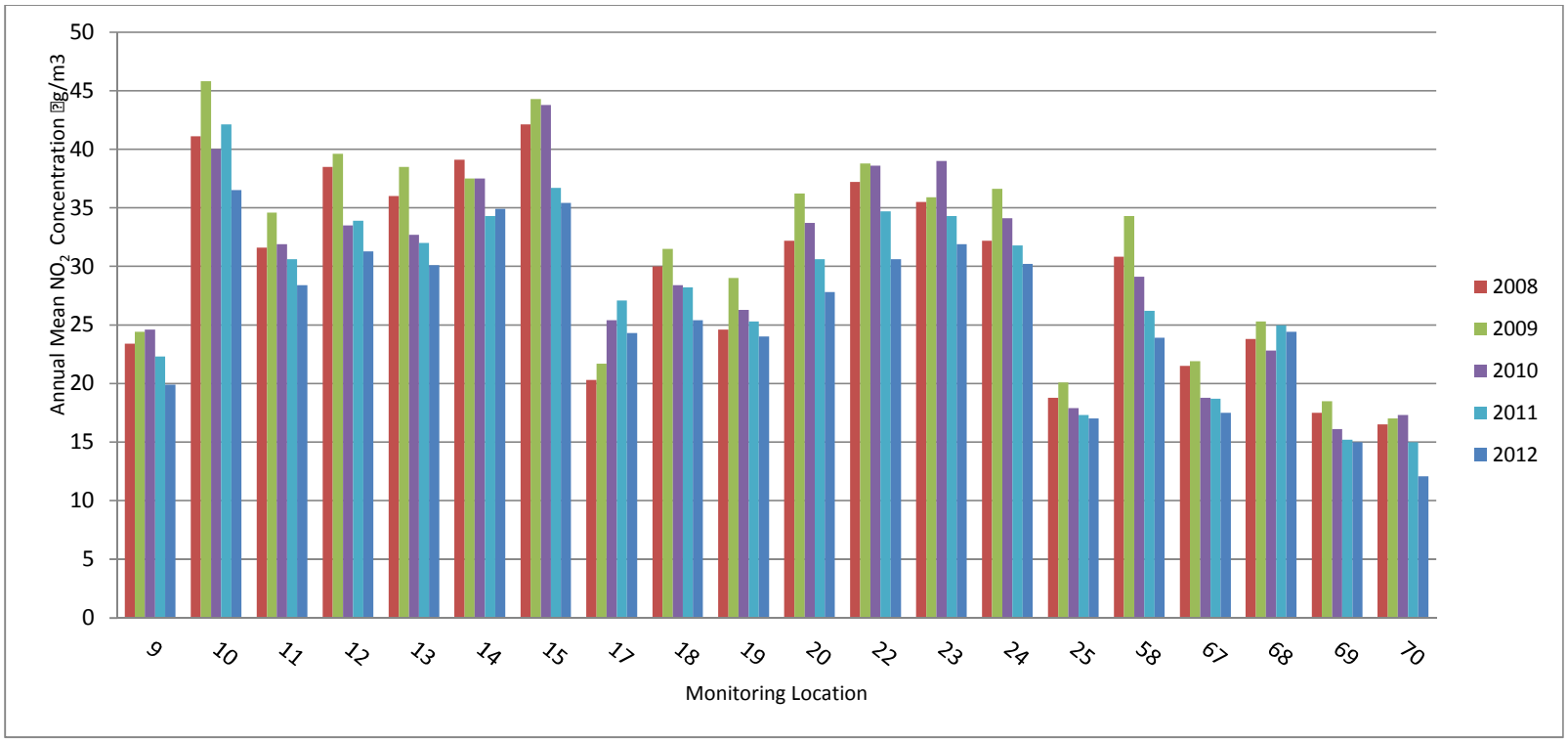
Site ID	Site Type	Within AQMA?	Annual Mean Concentration (µg/m^3) - Adjusted for Bias				
			2008 (Bias Adjustment Factor = 0.76)	2009 (Bias Adjustment Factor = 0.83)	2010 (Bias Adjustment Factor = 0.89)	2011 (Bias Adjustment Factor = 0.70)	2012 (Bias Adjustment Factor = 0.84)
55	Roadside	N	20.0	21.9	21.9	18.9	18.8
58	Roadside	N	30.8	34.3	29.1	26.2	23.9
61	Roadside	N	-	-	17.2	18.2	15.8
62	Roadside	N	-	-	18.8	17.8	18.1
63	Roadside	N	-	-	13.7	11.2	10.6
64	Roadside	N	-	-	12.2	11.6	10.8
66	Urban Background	N	26.2	26.0	24.0	22.8	21.9
67	Urban Background	N	21.5	21.9	18.8	18.7	17.5
68	Urban Background	N	23.8	25.3	22.8	25.0	24.4
69	Urban Background	N	17.5	18.5	16.1	15.2	15.0
70	Urban Background	N	16.5	17.0	17.3	15.0	12.1
71	Urban Background	N	-	-	17.2	18.3	17.5
72	Roadside	N	-	-	-	13.9	12.3
73	Urban Background	N	-	-	-	21.2	22.8
74	Roadside	N	-	-	-	15.5	15.0
75	Roadside	Y	-	-	-	-	30.1

Figure 2-6 Trends in Annual Mean Nitrogen Dioxide Concentrations Measured at Diffusion Tube Monitoring Sites – King's Lynn AQMA 1 - North



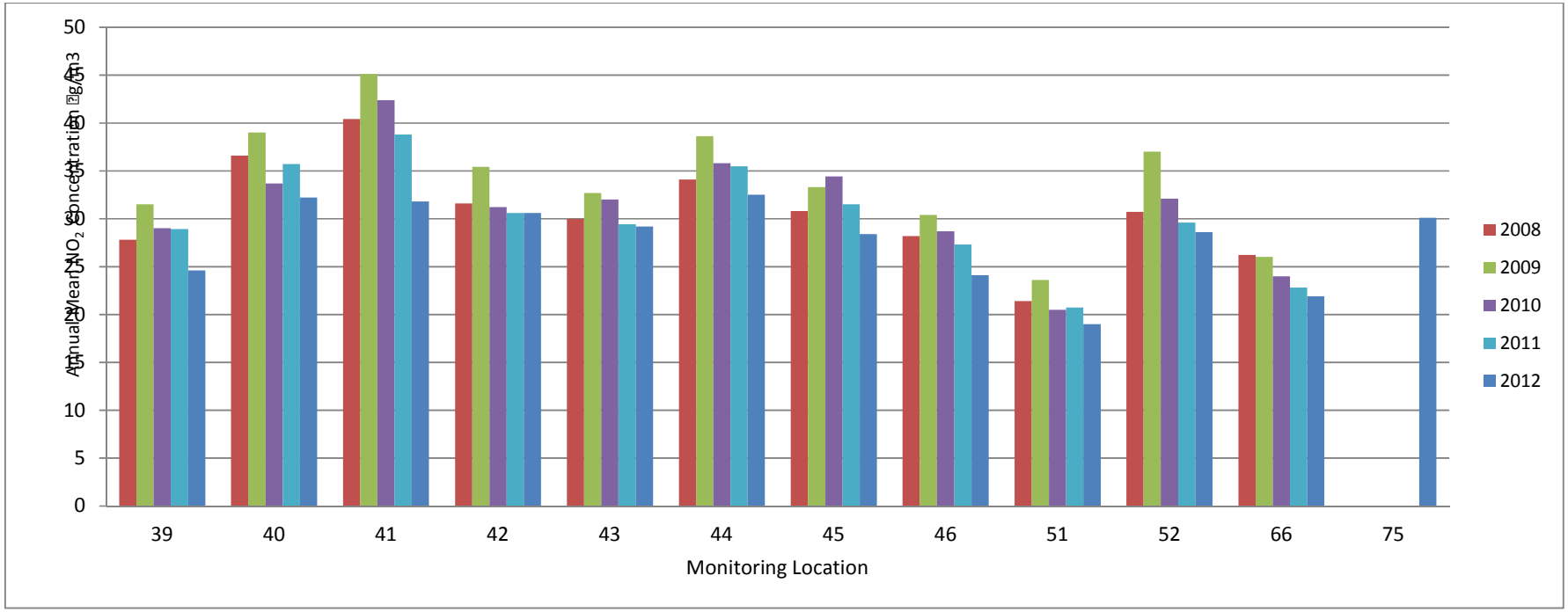
The above figure shows the trend in NO_2 concentration for those sites located in the North of the Town Centre and AQMA. For the majority of sites concentrations have fallen in 2012 when compared to the 2011 data, this has been a continuation of the decreasing trend observed in from the 2010 results onwards. Only one site showed an increase in concentrations, Site 1, located within the AQMA. The graph shows that in the North of the town there were 2 locations (Sites 2 and 5) where the concentration exceeded the annual mean of 40 µg/m^3.

Figure 2-7 Trends in Annual Mean Nitrogen Dioxide Concentrations Measured at Diffusion Tube Monitoring Sites – King's Lynn AQMA 1 – South



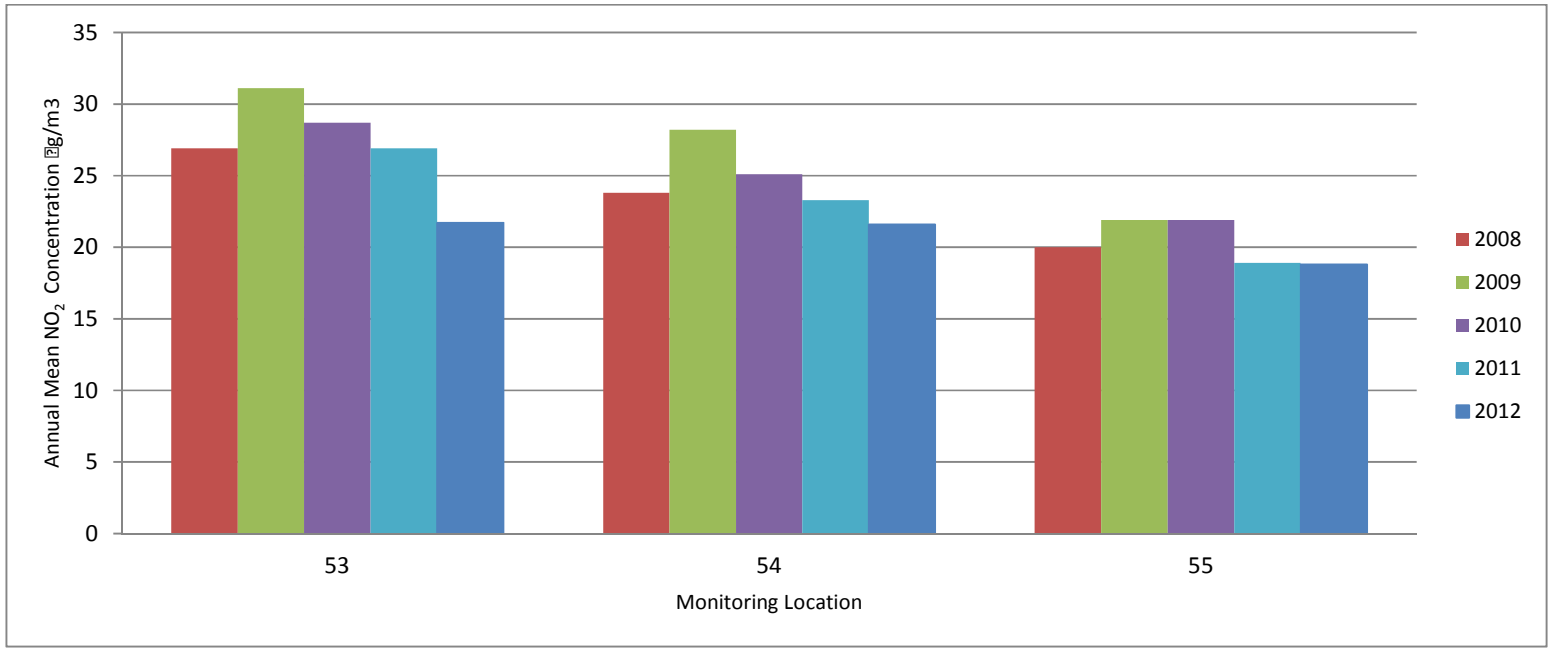
The above figure shows the trend in NO_2 concentration for those sites located in the South of the Town Centre and AQMA. For the majority of sites concentrations have fallen in 2012 when compared to the 2011 data, this has been a continuation of the decreasing trend observed in from the 2010 results onwards. The graph shows that in the South area of the King's Lynn AQMA there were no monitoring locations where the concentration exceeded the annual mean of 40 µg/m^3.

Figure 2-8 Trends in Annual Mean Nitrogen Dioxide Concentrations Measured at Diffusion Tube Monitoring Sites – Gaywood Clock



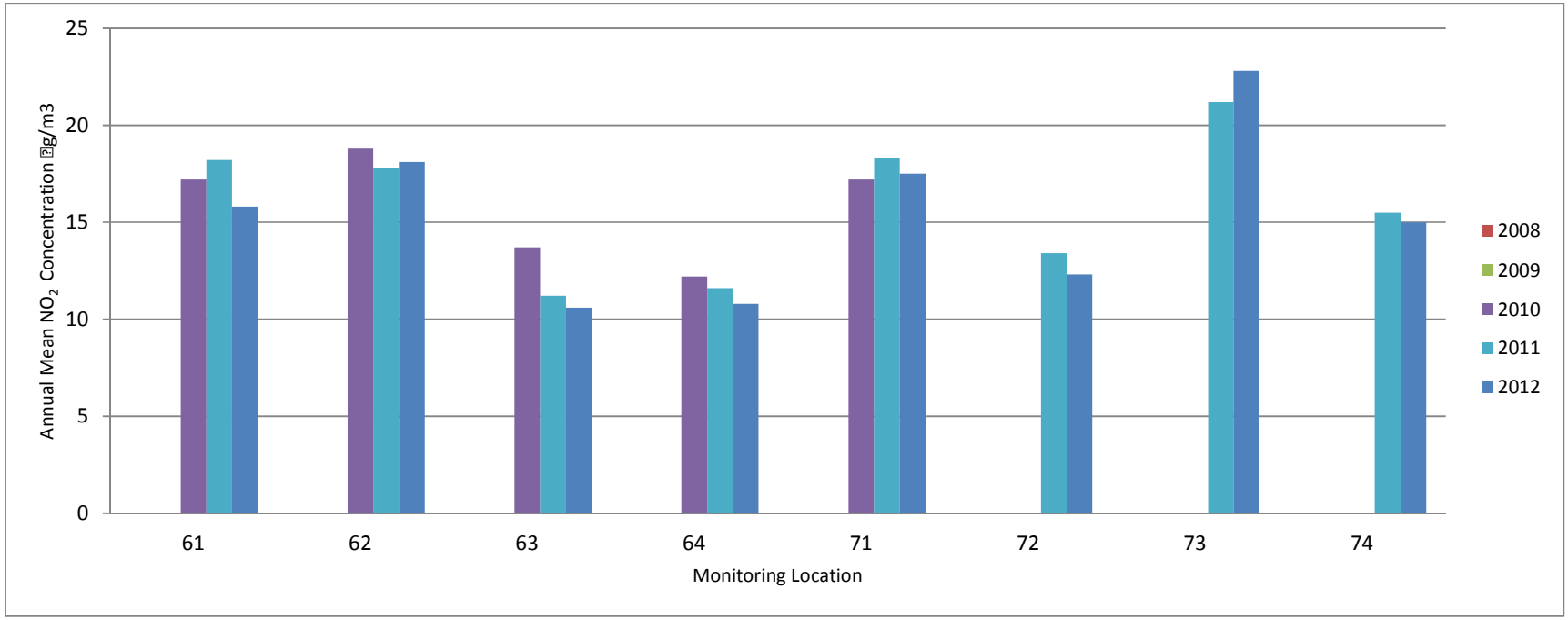
The above figure shows the trend in NO_2 concentration for those sites located in the Gaywood Clock AQMA and surrounding area. For all the sites in this area concentrations have fallen in 2012 when compared to the 2011 data, this has been a continuation of the decreasing trend observed in from the 2010 results onwards. The graph shows that in the Gaywood Clock area there were no monitoring locations where the concentration exceeded the annual mean of 40 $\mu g/m^3$.

Figure 2-9 Trends in Annual Mean Nitrogen Dioxide Concentrations Measured at Diffusion Tube Monitoring Sites – Wisbech



The above figure shows the trend in NO_2 concentration for those sites monitored in Wisbech in the east of the Borough. All three monitoring locations have shown a decrease in concentrations in 2012 when compared to the 2011 results; this has been a continuation of the decreasing trend observed in from the 2010 results onwards. For all sites the concentration remained below the annual mean objective of 40 $\mu g/m^3$.

Figure 2-10 Trends in Annual Mean Nitrogen Dioxide Concentrations Measured at Diffusion Tube Monitoring Sites – The Willows EfW Application



The above figure shows the trend in NO_2 concentration for those sites monitored as background sites as part of the planning application submitted for an Energy from Waste incinerator at The Willows Industrial Estate. Of those sites installed in 2010 and 2011, the majority have shown a decrease in concentrations. Site 73 is the only site to have shown an increase in annual mean concentration from the previous year's monitoring. For all sites the concentration remained below the annual mean objective of 40 $\mu g/m^3$.

2.2.2 Particulate Matter (PM_{10})

There are two Air Quality Objectives for PM_{10}, namely:

- the annual mean of 40µg/m^3; and
- the 24-hour mean of 50µg/m^3 not to be exceeded more than 35 times a year.

The Council undertook monitoring of PM_{10} using TEOM analysers at two locations during 2012. Osiris dust and particles analysers were also installed at three locations in 2012. Results for the TEOMs have been VCM[1] corrected and the Osiris data has also been corrected using a gravimetric factor of 1.3 by AQDM who conduct the data management for the Council. Data capture was below 90% at the Page Stair Lane Osiris, and as such the 90th percentile of PM_{10} 24-hour means is also reported.

The 2012 results show that the annual mean and the 24-hour mean continue to be met at both monitoring locations within the district. The 2012 pollutant levels show a decrease in concentration at Southgates and the continuing decreasing trend at Leziate.

There is a greater uncertainty in Osiris monitoring results as they are an indicative monitoring method only. Of the three sites, Leziate and Page Stair Lane show compliance with the annual mean and 24-hour mean AQS objective, however the Osiris located on Furlong Road, Stoke Ferry is shown to exceed the annual mean and the 24-hour mean AQS objective. The results for 2012 show that the PM_{10} concentrations at Page Stair Lane have decreased, whereas those at the Stoke Ferry monitoring site have increased significantly.

[1] Volatile Correction Model – Used to correct TEOM measurements for the loss of volatile components of particulate matter that occur due to the high sampling temperatures employed by this instrument

Table 2-8 Results of Automatic Monitoring for PM_{10}: Comparison with Annual Mean Objective

Site ID	Site Type	Within AQMA?	Valid Data Capture for Monitoring Period % [a]	Valid Data Capture 2012 % [b]	Confirm Gravimetric Equivalent (Y or N/A)	Annual Mean Concentration (µg/m^3)				
						2008	2009	2010	2011	2012
King's Lynn Southgates	Roadside	Y	97.7	97.7	Y	19	20	21	22	20
Leziate	Industrial	N	93.8	93.8	Y	-	27	21	20*	17
Leziate - Osiris	Industrial	N	92.4	92.4	N	-	-	-	25	12
Furlong Road, Stoke Ferry	Industrial	N	93.1	93.1	N	-	16.5	19.5	37	**70**
Page Stair Lane	Industrial	N	87.3	87.3	N	-	-	-	**42**	23

[a] "annualised" as in Box 3.2 of TG(09)

Figure 2-11 Trends in Annual Mean PM_{10} Concentrations

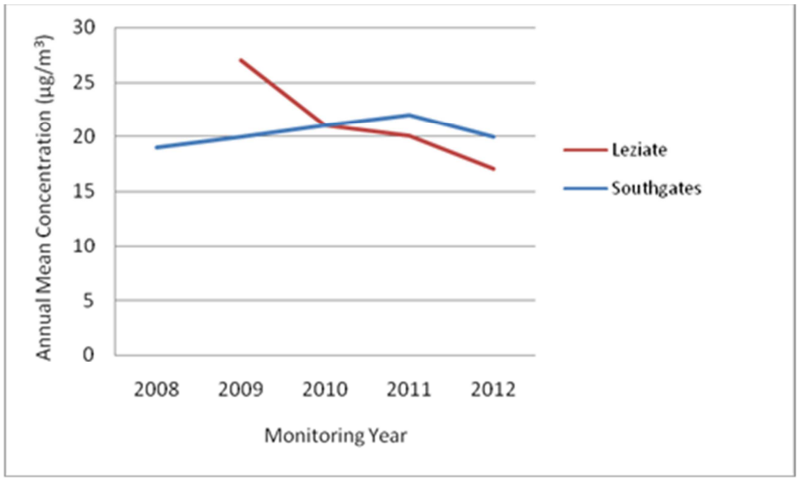


Figure 2.11 shows the trend in PM_{10} concentrations at the Southgates and Leziate monitoring locations. The graph shows for the Southgates site annual mean concentrations have remained relatively stable, with a slight increasing trend observed between 2008 and 2011. With regards to Leziate the trend has been more varied with a steep fall observed in 2009 and again in 2012. Both sites are currently showing a decrease in annual mean concentrations when compared to the 2011 results.

Table 2-9 Results of Automatic Monitoring for PM_{10}: Comparison with 24-hour Mean Objective

Site ID	Site Type	Within AQMA?	Valid Data Capture for Monitoring Period % [a]	Valid Data Capture 2012 % [b]	Confirm Gravimetric Equivalent (Y or N/A)	Number of Daily Means > 50µg/m^3				
						2008	2009	2010	2011	2012
King's Lynn Southgates	Roadside	Y	97.7	97.7	Y	1	3	1 (31.7)	3	4
Leziate	Industrial	N	93.8	93.8	Y	-	1	2 (31.9)	6 (41)[a]	1
Leziate - Osiris	Industrial	N	92.4	92.4	N	-	-	-	16	0
Furlong Road, Stoke Ferry	Industrial	N	93.1	93.1	N	-	-	-	22	**193**
Page Stair Lane	Industrial	N	87.3	87.3	N	-	-	-	**78**	16

[a] if data capture is less than 90%, include the 90th percentile of 24-hour means in brackets

2.2.3 Sulphur Dioxide (SO_2)

There is currently no Sulphur Dioxide monitoring undertaken by King's Lynn and West Norfolk Borough Council.

2.2.4 Benzene

There is currently no Benzene monitoring undertaken by King's Lynn and West Norfolk Borough Council.

2.2.1 $PM_{2.5}$

The target for $PM_{2.5}$ is an annual mean of 25μg/m^3 by 2020. $PM_{2.5}$ objectives have been set out in the UK Air Quality Regulations. There is no obligation upon local authorities to carry out monitoring of $PM_{2.5}$. The UK's monitoring requirements with respect to $PM_{2.5}$ are fulfilled by data from national monitoring networks.

The latest AEA-Ricardo Air Pollution Report for 2011 shows that the annual mean concentrations of $PM_{2.5}$ were within the limit value across the UK. As part of the Air Quality Directive the UK is required to achieve a National Exposure Reduction Target (NERT) for $PM_{2.5}$, between 2010 and 2020. The Average Exposure Indicator (AEI) statistic for the UK is 13μg/m^3. This AEI determines the NERT to be achieved by 2020. An AEI of 13μg/m^3 sets a reduction target of 15%.

2.2.2 Summary of Compliance with AQS Objectives

There were two NO_2 diffusion tube locations where the annual mean AQS Objective was exceeded in 2012, one of which were inside the existing Town Centre AQMA. The second site was located at the Bus Station 1 monitoring location. This site is not relevant of public exposure with regards to the annual mean NO_2 objective. From the 2012 data it is unlikely that the hourly NO_2 objective would be exceeded at this location as the annual mean is less than 60μg/m^3.

With regards to PM_{10}, the 2012 results show that the annual mean and the 24-hour mean continued to be met at both monitoring locations within the district. One of the Osiris monitoring locations, Furlong Road, Stoke Ferry, has shown there to be an exceedence of the annual mean and 24-hour mean AQS Objective.

King's Lynn and West Norfolk Borough Council has examined the results from monitoring in the borough.

Concentrations within the AQMAs still exceed the annual mean objective for NO_2 at several locations and the AQMA should remain.

King's Lynn and West Norfolk Borough Council has measured concentrations of PM_{10} above the annual and 24-hour mean objective at relevant locations outside of the AQMAs, and will need to proceed to a **Detailed Assessment**, for the Stoke Ferry Area.

3 New Local Developments

3.1 Road Traffic Sources

LAQM requires local authorities to consider the following:

- Narrow congested streets with residential properties close to the kerb;
- Busy streets where people may spend one hour or more close to traffic;
- Roads with a high flow of buses and/or HGVs;
- Junctions;
- New roads constructed since the last Updating and Screening Assessment;
- Roads with significantly changed traffic flows; and
- Bus or coach stations.

King's Lynn and West Norfolk Borough Council confirms that of the above categories there have been no new or newly identified which have not previously been considered in previous rounds of review and assessment.

The 2012 Updating and Screening Assessment considered two new developments on Hardwick Road, a new Tesco Superstore and Sainsbury Superstore. The Tesco development had an air quality assessment completed as part of the planning application. This predicted slight increases in NO_2 and PM_{10} at receptors along Hardwick Road. Both applications had highway improvements as part of the application and developments. King's Lynn and West Norfolk Borough Council have a diffusion tube installed on Hardwick Road. The 2012 annual mean concentration for this location was 25.4 $\mu g/m^3$. The annual mean objective continues to be met at this location, and the site continues to show a decreasing trend in NO_2 concentrations.

3.2 Other Transport Sources

LAQM requires local authorities to consider the following:

- Airports;
- Locations where diesel or stream trains are regularly stationary for periods of 15 minutes or more, with relevant exposure within 15m;
- Locations with a large number of movements of diesel locomotives and long term relevant exposure within 30m; and

- Shipping ports.

King's Lynn and West Norfolk Borough Council confirms that of the above categories there have been no new or newly identified sources which have not been considered in previous rounds of review and assessment.

3.3 Industrial Sources

LAQM requires local authorities to consider the following:

- Industrial Installations: new or proposed;
- Industrial installations: existing where emissions have increased substantially or relevant exposure introduced;
- Major fuel storage depots;
- Petrol stations; and
- Poultry farms.

King's Lynn and West Norfolk Borough Council confirms that of the above categories there have been no new or newly identified sources which have not been considered in previous rounds of review and assessment.

The Environment Agency have confirmed that there have been no increases of air emissions of more than 30% since April 2012 from permitted industrial installations[2].

As reported in the 2012 Updating and Screening Assessment Norfolk County Council had granted planning permission for The Willows Energy from Waste facility. The modelling undertaken as part of the application process did not predict any exceedences of the AQS Objectives.

Due to public concern regarding the application the Borough Council recommended that the operator should be required to fund air quality monitoring around the site. Norfolk County Council granted the application without air quality monitoring as a requirement.

[2] Environment Agency Information © Environment Agency and database right

King's Lynn and West Norfolk Borough Council continue to monitor NO_2 through the use of diffusion tubes in several locations around the development. The 2012 results show that at the majority of sites have shown a slight reduction on the annual mean concentration from the 2011 results. All sites remain below the annual mean objective of 40 $\mu g/m^3$.

King's Lynn and West Norfolk Borough Council will continue to monitor at these locations.

3.4 Commercial and Domestic Sources

LAQM requires local authorities to consider the following:

- Biomass combustion plant – individual installations;
- Areas where the combined impact of several biomass combustion sources may be relevant; and
- Areas where domestic solid fuel burning may be relevant.

Individual Installations

Kings' Lynn and West Norfolk Council have identified the following biomass installations which have not previously been assessed and are over 50KW in output.

- Hillgate Nurseries, Perkin Field, Terrington St Clement (9km from nearest AQMA);
- College of West Anglia, Tennyson Avenue, King's Lynn (400m from Town Centre AQMA, 600m from Gaywood Clock AQMA);
- Rokewood Nursery, Walton Road, Walsoken (17km from nearest AQMA); and
- Belmont Nursery, Long Lane, Terrington St Clement (8km from nearest AQMA).

A screening assessment has been undertaken by King's Lynn and West Norfolk Borough council for the College of West Anglia installation. The results of which are presented below:

Required Parameter	**Input**
Building Height (Tallest building within 5 x stack height)	8m
Stack Diameter	0.2m
Stack Height	9.35m
PM_{10} Annual Mean Background	17$\mu g/m^3$
NO_2 Annual Mean Background	21$\mu g/m^3$

Emission Rate Particulates (g/s)	0.0017
Emission Rate NOx (g/s)	0.0017
Target Emission Rate PM (g/s)	0.0461
Target Emission Rate NOx Annual (g/s)	0.0517
Target Emission Rate NOx Hourly (g/s)	0.0348

From the above table it can be seen that the actual emission rates are lower than the target emission rates for both PM_{10} and NOx, therefore it is not anticipated that this installation will have a significant impact upon air quality in the surrounding area.

There is currently insufficient data available to complete a screening assessment on the three remaining installations identified above. It is recommended that King's Lynn and West Norfolk Borough Council collate the necessary information and these are screened in the next LAQM report produced.

Combined Installations

King's Lynn and West Norfolk Borough Council has identified 29 biomass installations of less than 50KW output in the borough. Of these installations there are no instances where more than one appliance is found in a 500x500m squared area. Of these installations the majority are wood burner stoves or multi fuel stoves from domestic installations. Due to this it is considered unlikely that there will be an exceedence of the air quality objective with regards to PM_{10}.

3.5 New Developments with Fugitive or Uncontrolled Sources

LAQM requires local authorities to consider the following:

- Landfill sites;
- Quarries;
- Unmade haulage roads on industrial sites;
- Waste transfer stations; and
- Any other potential sources of fugitive particulate emissions.

King's Lynn and West Norfolk Borough Council confirms that of the above categories there have been no new or newly identified sources which have not been considered in previous rounds of review and assessment.

Several locations are under consideration as sites for Waste and Mineral Sites in the Local Plan. If any of these are developed, potential impacts will be considered in the next USA.

The list of sites is as follows:

- WAS05 – Estuary Road, King's Lynn;
- WAS25 and WAS36 – East Winch Road/Mill Drove Middleton;
- WAS37 – Lodge Road, Feltwell;
- WAS40 Mill Drove, Middleton;
- WAS45 – Docking Common, Docking;
- WAS65 Willows Business Park, King's Lynn;
- MIN6 – East Winch Road, Middleton;
- MIN19 – Penney Quarry, Pentney;
- MIN39 – East Winch Road, Ashwicken;
- MIN40 – Land East of Grand Court Farm, East Winch;
- MIN41 – Hall Farm, Roydon;
- MIN45 – Coxford Abbey Quarry, Syderstone;
- MIN75 – Home Farm, Watlington;
- MIN76 – West Field, Watlington.

King's Lynn and West Norfolk Borough Council has identified the following local developments which may impact on air quality in the Local Authority area.

Biomass Installations:

- Hillgate Nurseries, Perkin Field, Terrington St Clement
- Rokewood Nursery, Walton Road, Walsoken
- Belmont Nursery, Long Lane, Terrington St Clement

These will be taken into consideration in the next Updating and Screening Assessment when full emissions data is available for these installations.

4 Local / Regional Air Quality Strategy

King's Lynn and West Norfolk Borough Council does not have an Air Quality Strategy, however the Air Quality Action Plan considers the AQMAs and includes wider measures across the borough.

5 Planning Applications

King's Lynn and West Norfolk Borough Council has identified the following two planning applications, which may impact upon air quality.

Palm Paper Mill

The Palm Paper Mill CGTT application to IPC has been lodged, initial discusses have taken place over the scope of the application and likely impact on the local environment. The combined impact of this development along with others in the borough will also be considered including the Palm, Centrica A & B and Willows PRC developments.

Willows PRC

The Borough Council were a consultee to the Mineral & Waste Planning application by Cory Wheelabrator for a municipal waste incinerator to be located on land off Saddlebow Road, King's Lynn. The Borough Council has thoroughly assessed the air quality impact of this proposal and asked Air Quality Consultant Ltd to independently review the planning application. The review considered the impact of the Willows PRC and also the aggregate impact with adjacent industrial development such as Centrica A&B, Palm paper Mill & Sludge Combuster.

The Air Dispersion Modelling (ADM) predicted the ground level stack contributions from the proposed Willows Incinerator for a number of pollutants. For the majority of pollutants the levels were below the 1% screening level of the annual mean (Long Term) Environmental Assessment Levels (EAL) and below 10% of the short term EAL. Therefore the levels are deemed "insignificant".

However the ground level concentrations of nitrogen dioxide (NO_2), cadmium and arsenic are above the 1% screening level for the annual EAL. These levels have been compared with background concentrations and the maximum total predicted concentration of all three pollutants are all well below their relevant EAL. Therefore there is minimal risk to human health

Emissions of NO_2 from the Willows Incinerator stack will contribute 0.17 $\mu m/m^3$ of NO_2 at ground level within AQMAs in Kings Lynn. This is below the 1% screening level and therefore deemed insignificant. The Environmental Protection UK (EPUK) air quality guidance states that <1% increase is imperceptible. Therefore with a background concentration above 40 $\mu g/m^3$, the impact of the Willows proposal will be "Negligible"

ADM shows that the levels of NO_2 emitted from the Willows will not lead to an extension to either the two existing AQMAs or will create any additional AQMA surrounding the site.

ADM shows that the levels of particles (PM_{10}) from the stack would be below the 1% EAL and are therefore deemed insignificant. The applicant has provided additional information on the levels of particle emission including PM_{10}, $PM_{2.5}$ and nanoparticles.

6 Air Quality Planning Policies

The Council adopted the Local Development Framework (LDF) Core Strategy on the 28th July 2011. The Core Strategy is the main document which sets out the long term strategy for the borough and policies which will shape new development. It will guide development and the use of land up to 2025. The Core Strategy is linked to the Sustainable Community Strategy produced in association with the West Norfolk Partnership.

Contained in the Core Strategy are four key vision points, including Environment as stated below;

'*We want to safeguard our justifiably famous natural and historic environment, at the same time making sustainability a central principle to our vision. We want to build connections with other local and regional economies, reduce reliance on the car, and prepare ourselves for the challenges of climate change'*.

From the vision are Core Strategy Objectives, those relating to Environment are listed below;

- West Norfolk has undergone regeneration and growth that is well planned and complements its high quality historical and natural inheritance.
- Communities benefit from quality public spaces and parks with access to the coast and countryside that make the area special.
- West Norfolk is meeting the challenges of climate change and reducing or mitigating carbon emissions.
- Public transport has improved and people are less reliant on the motor car to access places and services.
- West Norfolk is still considered to be somewhere unique retaining its own local distinctiveness.

The following policies have reference to air quality within them:

Policy CS08 Sustainably Development

- All new development in the borough should promote and encourage opportunities to achieve high standards of sustainability and energy efficiency, with measures including:
    - Design and construction techniques to improve efficiency
    - Reduction of on-site emissions by generation of cleaner energy

- Good access links for walking and cycling
- Support of renewable energy generation

Policy CS11 Transport

- Improving strategic networks serving passenger and freight movements to reduce congestion and improve reliability and safety
- Bypasses for Middleton and East Winch and West Winch and junction improvements
- Improvements to rail infrastructure and services on the King's Lynn to Cambridge/King's Cross Line
- Implementation of the KLATS schemes including improvements in King's Lynn – balance ease of access and car parking with flows, highway safety and alternatives such as park and ride and a second parkway station
- Achieving improvements within the towns of King's Lynn, Downham Market and Hunstanton, particularly where there are air quality issues.
- Achieving a balanced package of highway, traffic management (including car parking) and public transport improvements.
- Maximising the use of alternative modes of freight movement via rail and the port
- New Developments should demonstrate that they have been designed to:
  - Reduce the need to travel.
  - Promote sustainable forms of transport appropriate for their location, including walking, cycling, public transport
  - Private car (development proposals which are likely to have significant transport implications will need to be accompanied by a transport assessment and travel plan to show how car based travel can be minimised)

In addition to the above document, King's Lynn and West Norfolk Borough Council Environmental Quality Team are currently in discussion with the Borough planners regarding the inclusion of air quality policy in the Local Plan. Air quality will be included as part of POAW4: Environment, Design and Amenity. This document is currently in draft form and is likely to go to the consultation stage in 2013.

7 Local Transport Plans and Strategies

The 3rd Local Transport Plan for Norfolk, *Connecting Norfolk*, covering 2011 to 2026 was adopted in March 2011. The six key priorities identified for transport are:

- Maintaining and managing the highway network;
- Delivering sustainable growth;
- Enhancing strategic connections;
- Reducing emissions;
- Improving road safety; and
- Improving accessibility.

In October 2012 the first Strategic Environmental Assessment / Sustainability Appraisal (SEASA) monitoring report was completed, establishing the current state of the environment and changes to indicators that have occurred between 2010/11 and 2011/12. The indicators were developed to measure the effects that the LTP3 strategy and implementation plan might have.

The following SEASA objectives have links to Air Quality

ENV 1

- CO_2 tonnes from road transport – improving

ENV 2

- Number of AQMAs due to transport – remains the same
- Concentrations of NO_2 Gaywood King's Lynn –air quality improving
- Concentrations of NO_2 Railway Road King's Lynn –air quality declining increasing

The King's Lynn Area Transport Strategy (KLATS) will set of the way in which transport issues are addressed in the King's Lynn area over the 2011 – 2015 period. The Stage 1 final report recommended that the Borough Council sets up an Air Quality Steering Group (AQSG) to finalise options and implement the AQMA Action Plan. The Stage 1 report developed transport models to aid the development of strategy and potential interventions

and the impacts of the LDF. The report considered public transport, cycling infrastructure, car parking and additional rail facilities. The report contained a list of possible interventions for consideration by the Growth Point Board and further actions, including the following

- Highway Schemes – including Bypass linking North Lynn and West Lynn, Gaywood Link Road, A149 Queen Elizabeth Way dualling
- Traffic Management Schemes – including inbound high occupancy vehicle lane at Gaywood Clock junction and Wotton Road, improvements to the A47 Pullover Roundabout, town centre 20mph zone
- Public Transport Schemes – including inbound contraflow bus lane on Railway Road, park and ride at Saddlebow East/ South Lynn
- Dedicated bus and cycle routes between Wisbech Road and Millfleet, cycle links to the National Cycle Network

8 Climate Change Strategies

The Sustainability Appraisal completed as part of the Core strategy lists the following issues to be considered when determining future development within the borough:

- Impending climate change and issues associated with it.
- There is a potential lack of water resources due to over abstraction, and climate change leading to decreased water availability.
- Greenhouse gas emissions from the borough are contributing to climate change, and are higher than the national average.

The following policies provide guidance as to how the Council are planning to deal with the issue of climate change:

- Policy CS07 - Development in Coastal Areas
- Policy CS08 – Sustainably Development
- Policy CS12 – Environmental Assets

9 Implementation of Action Plans

King's Lynn and West Norfolk Borough Council have developed a draft AQAP in 2013. An Air Quality Steering Group has been set to finalise the draft AQAP.

The Steering Group is chaired by the Portfolio Holder for the Environment and includes Environment and Planning officers (Exec Director, Environmental Quality, LDF, and Development Control), Car Parks, Regeneration & NCC Highways departments.

The report will need to be presented for consultation to statutory consultees including DEFRA and the community of King's Lynn and West Norfolk. The report will be made available for consultation for an 8 week period via the borough council's website.

Once approved by the Borough Council of King's Lynn and West Norfolk Cabinet and the Secretary of State the plan will be fully adopted. Once adopted and fully integrated into the Norfolk Local Transport Plan the borough and county council's will collaborate to implement the measures in the AQAP and in monitoring progress.

10 Conclusions and Proposed Actions

10.1 Conclusions from New Monitoring Data

The review of 2012 monitoring data found that there were two NO_2 diffusion tube locations where the annual mean AQS Objective was exceeded in 2012, one of which was inside the existing Town Centre AQMA. The second site was located at the Bus Station 1 monitoring location. This site is not relevant of public exposure with regards to the annual mean NO_2 objective. From the 2012 data it is unlikely that the hourly NO_2 objective would be exceeded at this location as the annual mean is less than 60μg/m^3.

With regards to PM_{10}, the 2012 results show that the annual mean and the 24-hour mean continued to be met at both monitoring locations within the district. One of the Osiris monitoring locations, Furlong Road, Stoke Ferry, has shown there to be an exceedence of the annual mean and 24-hour mean AQS Objective. King's Lynn and West Norfolk Borough Council should proceed to a detailed assessment with regards to PM_{10} in this area.

10.2 Conclusions relating to New Local Developments

There are three biomass installations for which full emissions and stack information is currently unavailable. All three are located a considerable distance from the AQMAs and in rural locations, as such it is considered unlikely that they will lead to an exceedence of the Air Quality Objectives for either PM_{10} or NO_2. King's Lynn and West Norfolk Borough Council will continue to liaise with relevant stakeholders to obtain the necessary information. These installations will be assessed in the next LAQM report.

As reported in the 2012 Updating and Screening Assessment Norfolk County Council had granted planning permission for The Willows Energy from Waste facility. The modelling undertaken as part of the application process did not predict any exceedences of the AQS Objectives. King's Lynn and West Norfolk Borough Council continue to monitor NO_2 through the use of diffusion tubes in several locations around the development. The 2012 results show that at the majority of sites have shown a slight reduction on the annual mean concentration from the 2011 results. All sites remain below the annual mean objective of 40 μg/m^3. King's Lynn and West Norfolk Borough Council will continue to monitor at these locations.

10.3 Proposed Actions

Proposed actions arising from the 2013 Annual Progress Report are as follows:

- Continue NO_2 diffusion tube and continous monitoring in the district to identify future changes in pollutant concentrations;
- Proceed to a Detailed Assessment with regards to PM_{10} in the Stoke Ferry area;
- Continue to gather emission and stack information for the identified biomass installations to determine their potential impact upon air quality; and
- Proceed to a Progress Report in 2014.

11 References

- Local Air Quality Management Technical Guidance LAQM.TG(09). February 2009. Published by Defra in partnership with the Scottish Government, Welsh Assembly Government and Department of the Environment Northern Ireland
- King's Lynn and West Norfolk Borough Council 2012 Updating and Screening Assessment
- King's Lynn and West Norfolk Borough Council 2011 Annual Progress Report
- Air Quality Action Plan for the King's Lynn Town Centre and Gaywood Clock Air Quality Management Areas, 2013
- King's Lynn and West Norfolk Borough Council Local Development Framework – Core Strategy 2011
- King's Lynn Area Transportation and Land Use Study Stage 1 Final Report, March 2009
- Norfolk County Council's 3rd Local Transport Plan Strategic Environmental Assessment, First Monitoring Report 2011/12
- Environment Agency Information © Environment Agency and database right
- Air Pollution in the UK 2011 – Compliance Assessment Summary, AEA September 2012

12 Appendices

Appendix A: Quality Assurance / Quality Control (QA/QC) Data

Appendix A: QA:QC Data

Diffusion Tube Bias Adjustment Factors

Factor from Local Co-location Studies

King's Lynn and West Norfolk Borough Council do operate a continuous analyser and have a triplicate co-located tubes, the Local Bias Adjustment Factor is 0.84.

The overall survey is classed as having good precision and good data capture.

There were 2 periods of poor precision and one period of poor data capture from the continuous monitor. Therefore the bias adjustment factor is calculated using the 8 periods of good data.

Location	Diffusion Tube Data capture	Continuous Monitor Data Capture	Diffusion Tube Annual Mean ($\mu g/m^3$)	Continuous Monitor Annual Mean ($\mu g/m^3$)	Ratio
Southgates	97%	93%	28	24	0.84

Diffusion Tube Bias Adjustment Factors

The diffusion tubes are supplied and analysed by Gradko International Ltd utilising the 20% Triethanolamine (TEA) in water preparation method. The bias adjustment factor for 2012 is 0.97 (based on 27 studies, version 03_13) as derived from the national bias adjustment calculator.

Discussion of Choice of Factor to Use

The local bias adjustment factor has been used in the main body of the report as data capture and tube precision were considered good for the overall survey. The National Bias Adjustment factor has been presented in the appendix also.

PM Monitoring Adjustment

Particulate monitoring adjustment is completed by Air Quality Data Management (AQDM).

Short to Long Term Adjustment

Annualisation was required at five sites as detailed in the below table.

Site	Market Harborough Annualisation Factor	Wicken Fen Annualisation Factor	Norwich Annualisation Factor	Average Annualisation Factor
Site 3	0.900	1.019	1.070	0.996
Site 9	0.872	1.089	1.114	1.025
Site 17	1.670	0.991	0.861	1.174
Site 71	1.093	1.030	0.954	1.026
Site 75	0.663	0.913	1.161	0.912

QA/QC of Automatic Monitoring

The sites are part of the National Automatic Monitoring Calibration Club, where data are managed to the same QA procedures and standards as the UK Automatic Urban and Rural Network (AURN) sites.

QA/QC of Diffusion Tube Monitoring

Gradko International Ltd is a UKAS accredited laboratory and participates in the Workplace Analysis Scheme for Proficiency (WASP) for NO_2 diffusion tube analysis and the Annual Field Inter-Comparison Exercise. These provide strict performance criteria for participating laboratories to meet, thereby ensuring NO_2 concentrations reported are of a high calibre. The lab follows the procedures set out in the Harmonisation Practical Guidance. In the latest available WASP results, rounds 116 through to 119 (January to December 2012) Gradko International have scored 100%. The percentage score reflects the results deemed to be satisfactory based upon the z-score of $< \pm 2$. The tube precision for the NO_2 Annual Field Inter-comparison at Marylebone Road was rated as 'Good'.

Bureau Veritas Air Quality **King's Lynn and West Norfolk Borough Council**

Monthly Diffusion Tube Results

Site Ref	NO_2 Concentrations µg/m^3											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	44.0	55.0	53.0	38.0	M	M		42.0	38.0	47.0	49.0	43.0
2	57.0	57.0	53.0	39.0	38.0	40.0		M	50.0	49.0	62.0	62.0
3		59.0		41.0	38.0	31.0		M	46.0	54.0	54.0	43.0
4	39.0	59.0	52.0		37.0	30.0		36.0	34.0	41.0	45.0	38.0
5	46.0	56.0	53.0	43.0	37.0	36.0		50.0	50.0	49.0	63.0	52.0
6,7,8	36.0	34.0	34.0	26.0	26.0	19.0		24.0	26.0	30.0	32.0	30.0
9				22.0	18.0	15.0		19.0	18.0	29.0	33.0	31.0
10	44.0	44.0	52.0	37.0	37.0	34.0		37.0	42.0	42.0	58.0	51.0
11	37.0	37.0	37.0	26.0	27.0	26.0		31.0	33.0	38.0	43.0	37.0
12	40.0	50.0	40.0	31.0	M	28.0		30.0	38.0	40.0	43.0	33.0
13	39.0	41.0	44.0	32.0	29.0	25.0		27.0	36.0	40.0	47.0	34.0
14	45.0	45.0	52.0	33.0		51.0		29.0	37.0	41.0	45.0	37.0
15	48.0	47.0	51.0	38.0	39.0	29.0		35.0	37.0	45.0	47.0	47.0
17	36.0	34.0	36.0	3.0	21.0	18.0						
18	36.0	37.0	36.0	27.0	19.0	20.0		24.0	26.0	32.0	39.0	36.0
19	33.0	34.0	33.0	25.0	20.0	22.0		26.0	28.0	29.0	35.0	29.0
20	36.0	43.0	21.0	34.0	33.0	27.0		30.0	29.0	39.0	40.0	32.0
22	40.0	41.0	47.0		36.0	30.0		32.0	9.0	44.0	46.0	39.0
23	40.0	39.0	46.0	36.0	39.0			27.0	35.0	40.0	41.0	37.0
24	34.0	38.0	44.0	37.0	35.0	32.0		31.0	35.0	39.0	36.0	34.0
25	28.0	24.0	25.0	16.0	13.0	11.0		14.0	22.0	20.0	27.0	22.0
26	42.0	46.0	48.0	42.0	38.0	35.0			35.0	47.0	48.0	38.0
27	36.0	42.0	44.0	32.0	32.0	28.0		30.0	34.0	37.0	38.0	34.0
28	38.0	38.0		34.0	26.0	26.0		35.0	34.0	39.0	40.0	21.0
29	31.0	32.0	29.0	20.0	14.0	17.0		19.0	26.0	26.0	30.0	27.0
30	31.0	35.0		24.0	21.0	18.0		22.0	25.0	28.0	31.0	27.0
31	38.0	47.0	52.0	35.0				38.0	35.0	42.0	46.0	39.0
32	34.0	43.0	41.0	33.0	28.0	22.0			30.0	39.0	41.0	35.0
33	36.0			31.0	25.0	22.0		30.0	33.0	37.0	40.0	32.0
34	36.0	41.0	42.0	34.0	26.0	27.0		34.0	38.0	39.0	39.0	42.0
35	39.0	40.0	41.0	32.0	28.0	24.0		28.0	33.0	34.0	40.0	37.0
36	39.0	46.0	41.0	30.0	27.0	26.0		31.0	31.0	37.0	39.0	41.0
37	35.0	28.0	40.0	34.0	28.0	24.0		42.0	27.0	30.0	36.0	35.0

38	40.0		49.0	40.0	27.0	35		40.0	39.0	41	47.0	44.0
39	38.0	33.0	35.0	29.0	24.0	16.0		27.0	27.0	29.0	35.0	29.0
40	43.0	41.0	44.0	44.0	27.0	26.0		34.0	36.0	38.0	45.0	44.0
41	42.0			39.0	32.0	29.0		36.0	34.0	41.0	47.0	41.0
42	41.0	45.0	42.0	36.0	30.0	27.0		32.0	35.0	38.0	41.0	34.0
43	41.0	36.0	39.0	42.0	33.0	21.0		27.0	32.0	35.0	41.0	35.0
44	46.0	38.0	53.0	35.0	36.0	28.0		31.0	37.0	43.0	41.0	37.0
45	36.0	39.0	45.0	35.0	27.0	22.0			26.0	36.0	36.0	36.0
46	34.0	33.0	38.0	32.0	25.0	16.0		16.0	26.0	31.0	34.0	30.0
47	48.0	49.0	51.0	38.0	36.0	28.0		37.0	36.0	40.0	45.0	39.0
48	39	40	42	31	22	26		37	33	35	42	38
51	29	30	27	22	15	13		20	16	24	27	26
52	41	42	41	36	29	24		28	30	34	38	31
53	30	32	33	24	21	18		22	25	29	30	20
54	31	28	34	24	23	17		21	23	24	30	28
55	27	31	30	21	12	12		16	20	22	29	26
58		22	38	29	26	20		23	23	33	37	33
61	27	25	24	14	12	12		15	17	20	M	22
62		56	23	14	10	11		14	15	20	27	25
63	16	20	17	8	7	5		8	9	12	18	19
64	17	17	18	8	9	7		9	8	15	16	18
66	31	33	33	24	17	17		20	25	26	29	32
67	26	28	27	14	11	12		17	22	22	27	23
68	29	36		54	23	16		20	24	25	32	31
69	22	23	21	15	12			12	14	18	21	20
70	21	19	20	12	8	9		12	15	7	21	
71		30	26	15	12	13			19			27
72	21	21	20	11	9	8		9	13			20
73	31	34	32	28	29	18		21	18	31	29	
74	22	25	23	15	13	10		12	16	19	21	21
75								37	34	41	43	41

Bureau Veritas Air Quality King's Lynn and West Norfolk Borough Council

2012 Diffusion Tube Results – National Bias Adjustment Factor

Site ID	Site Type	Within AQMA?	Annual Mean Concentration (µg/m^3) - Adjusted for Bias	
			2012 (National Bias Adjustment Factor = 0.97)	2012 (Local Bias Adjustment Factor = 0.84)
1	Kerbside	Y – Town Centre	**44.1**	38.2
2	Roadside	Y – Town Centre	**49.2**	**42.6**
3	Roadside	Y – Town Centre	**44.2**	38.3
4	Kerbside	Y – Town Centre	39.9	34.5
5	Roadside (Bus Station)	N	**47.2**	**40.9**
6,7,8	Roadside	Y – Town Centre	28.0	24.2
9	Roadside	N	23.0	19.9
10	Roadside	Y	**42.2**	36.5
11	Roadside	Y – Town Centre	32.8	28.4
12	Roadside	Y – Town Centre	36.2	31.3
13	Roadside	Y – Town Centre	34.7	30.1

Site ID	Site Type	Within AQMA?	Annual Mean Concentration (µg/m^3) - Adjusted for Bias	
			2012 (National Bias Adjustment Factor = 0.97)	2012 (Local Bias Adjustment Factor = 0.84)
14	Roadside	Y – Town Centre	**57.2**	**49.6**
15	Roadside	Y – Town Centre	**40.8**	35.4
17	Roadside	N	28.1	24.3
18	Roadside	N	29.3	25.4
19	Roadside	N	27.7	24.0
20	Kerbside	Y – Town Centre	32.1	27.8
22	Roadside	Y – Town Centre	35.3	30.6
23	Roadside	Y – Town Centre	36.9	31.9
24	Roadside	Y – Town Centre	34.8	30.2
25	Urban Background	N	19.6	17.0
26	Roadside	Y – Town Centre	**40.6**	35.2
27	Roadside	Y – Town Centre	34.1	29.6
28	Roadside	Y – Town Centre	32.1	27.8

Site ID	Site Type	Within AQMA?	Annual Mean Concentration (µg/m^3) - Adjusted for Bias	
			2012 (National Bias Adjustment Factor = 0.97)	2012 (Local Bias Adjustment Factor = 0.84)
29	Kerbside	N	23.9	20.7
30	Kerbside	N	25.4	22.0
31	Kerbside	Y – Town Centre	**40.1**	34.7
32	Roadside	Y – Town Centre	33.6	29.1
33	Kerbside	N	30.8	26.7
34	Roadside	Y – Town Centre	35.1	30.4
35	Roadside	Y – Town Centre	33.2	28.7
36	Roadside	Y – Town Centre	34.2	29.6
37	Roadside	Y – Town Centre	31.7	27.4
38	Roadside	Y – Town Centre	39.0	33.8
39	Roadside	N	28.4	24.6
40	Roadside	Y – Gaywood Clock	37.2	32.2

Site ID	Site Type	Within AQMA?	Annual Mean Concentration (µg/m^3) - Adjusted for Bias	
			2012 (National Bias Adjustment Factor = 0.97)	2012 (Local Bias Adjustment Factor = 0.84)
41	Roadside	Y – Gaywood Clock	36.8	31.8
42	Roadside	Y – Gaywood Clock	35.4	30.6
43	Roadside	Y – Gaywood Clock	33.7	29.2
44	Roadside	Y – Gaywood Clock	37.5	32.5
45	Roadside	N	32.8	28.4
46	Roadside	N	27.8	24.1
47	Roadside	Y – Town Centre	39.4	34.1
48	Roadside	Y – Town Centre	34.0	29.4
51	Roadside	N	22.0	19.0
52	Roadside	N	33.0	28.6
53	Roadside	N	25.0	21.7
54	Roadside	N	25.0	21.6

Site ID	Site Type	Within AQMA?	Annual Mean Concentration (µg/m^3) - Adjusted for Bias	
			2012 (National Bias Adjustment Factor = 0.97)	2012 (Local Bias Adjustment Factor = 0.84)
55	Roadside	N	21.7	18.8
58	Roadside	N	27.5	23.9
61	Roadside	N	18.2	15.8
62	Roadside	N	20.9	18.1
63	Roadside	N	12.3	10.6
64	Roadside	N	12.5	10.8
66	Urban Background	N	25.3	21.9
67	Urban Background	N	20.2	17.5
68	Urban Background	N	28.1	24.4
69	Urban Background	N	17.3	15.0
70	Urban Background	N	14.0	12.1
71	Urban Background	N	20.2	17.5
72	Roadside	N	14.2	12.3
73	Urban Background	N	26.3	22.8
74	Roadside	N	17.4	15.0
75	Roadside	Y	34.7	30.1