KING'S LYNN AND WEST NORFOLK BOROUGH COUNCIL

LAQM ANNUAL PROGRESS REPORT 2011

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Executive Summary

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

This Progress Report considers all new monitoring data and assesses the data against the Air Quality Strategy Objectives. It also considers any development changes that may have an impact on air quality as well as updating on any relevant strategy and policy changes.

Having considered the latest monitoring data and development updated, it is concluded that the air quality objectives for benzene, 1, 3-butadiene, carbon monoxide, lead, PM_{10} and sulphur dioxide will be met. There is no requirement to undertake a Detailed Assessment for these pollutants.

No exceedences of the annual mean nitrogen dioxide objective were recorded outside of the two Air Quality Management Areas. Therefore no Detailed Assessment is required for this pollutant.

Proposed actions arising from this Progress Report are as follows:

- Continue with current continuous automatic monitoring programme for NO_2 at Southgates Road in King's Lynn;
- Continue with NO_2 diffusion tube monitoring in the Borough, especially in the King's Lynn AQMAs and along other parts of the town centre outside the AQMAs;
- Develop Action Plans to work towards compliance with the air quality objectives within the two AQMAs. These plans should draw upon the results of the Further Assessments of the AQMAs which will provide information about the pollutant reductions required to comply with the objectives and source contributions in each area;
- Progress to a 2012 Updating and Screening Assessment, to be completed by April 2012.

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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 comprises of 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 2003, the population of King's Lynn & West Norfolk was estimated at approximately 137,900 (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 the 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 and evidence that PM_{10} levels met the objective.

1.2 Purpose of Progress Report

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 Local Air Quality Management 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 Air Quality 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 Local Air Quality Management (LAQM) in England are set out in the Air Quality (England) Regulations 2000 (SI 928), and the Air Quality (England) (Amendment) Regulations 2002 (SI 3043). They are shown in Table 1. This table shows the objectives in units of microgrammes per cubic metre (µg/m^3). For carbon monoxide the units used are milligrammes per cubic metre (mg/m^3). Table 1 includes the number of permitted exceedences in any given year (where applicable).

Table 1 - Air Quality Objectives included in Regulations for the purpose of Local Air Quality Management in England

Pollutant	Concentration	Measured as	Date to be Achieved by
Benzene (C_6H_6)	16.25 µg/m^3	Running annual mean	31.12.2003
	5.00 µg/m^3	Running annual mean	31.12.2010
1,3-Butadiene (C_4H_6)	2.25 µg/m^3	Running annual mean	31.12.2003
Carbon Monoxide (CO)	10.0 mg/m^3	Running 8-hour mean	31.12.2003
Lead	0.5 µg/m^3	Annual mean	31.12.2004
	0.25 µg/m^3	Annual mean	31.12.2008
Nitrogen Dioxide (NO_2)	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
Particles (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 (SO_2)	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 levels 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 Air Quality Action Plan 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 of 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 a 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. The current extent of the AQMA is shown in Figure 1.

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 Gaywood AQMA is shown in Figure 2.

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 Annual Progress Report concluded that no new Detailed Assessment was required as there was no new exceedence recorded outside the AQMAs.

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

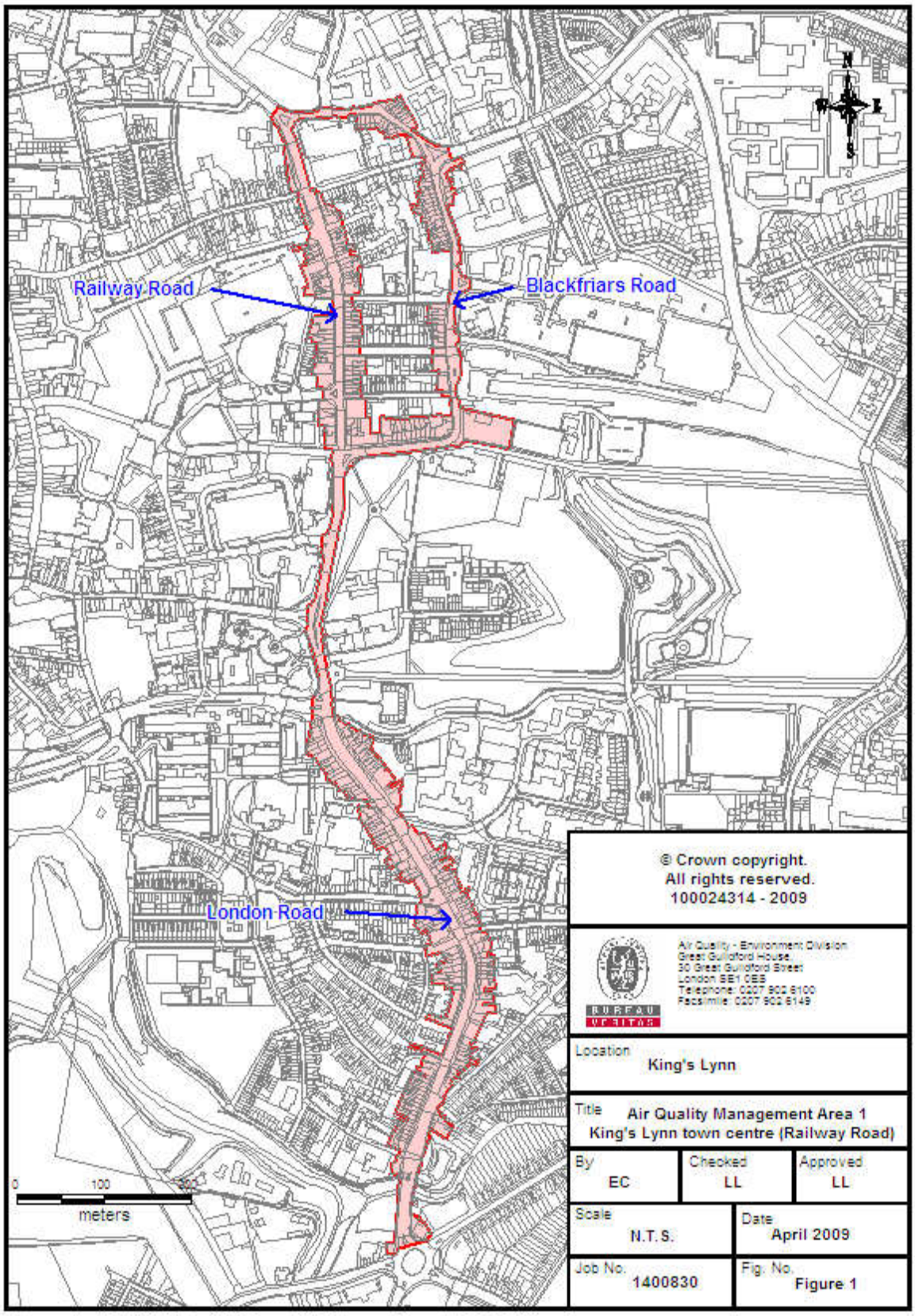
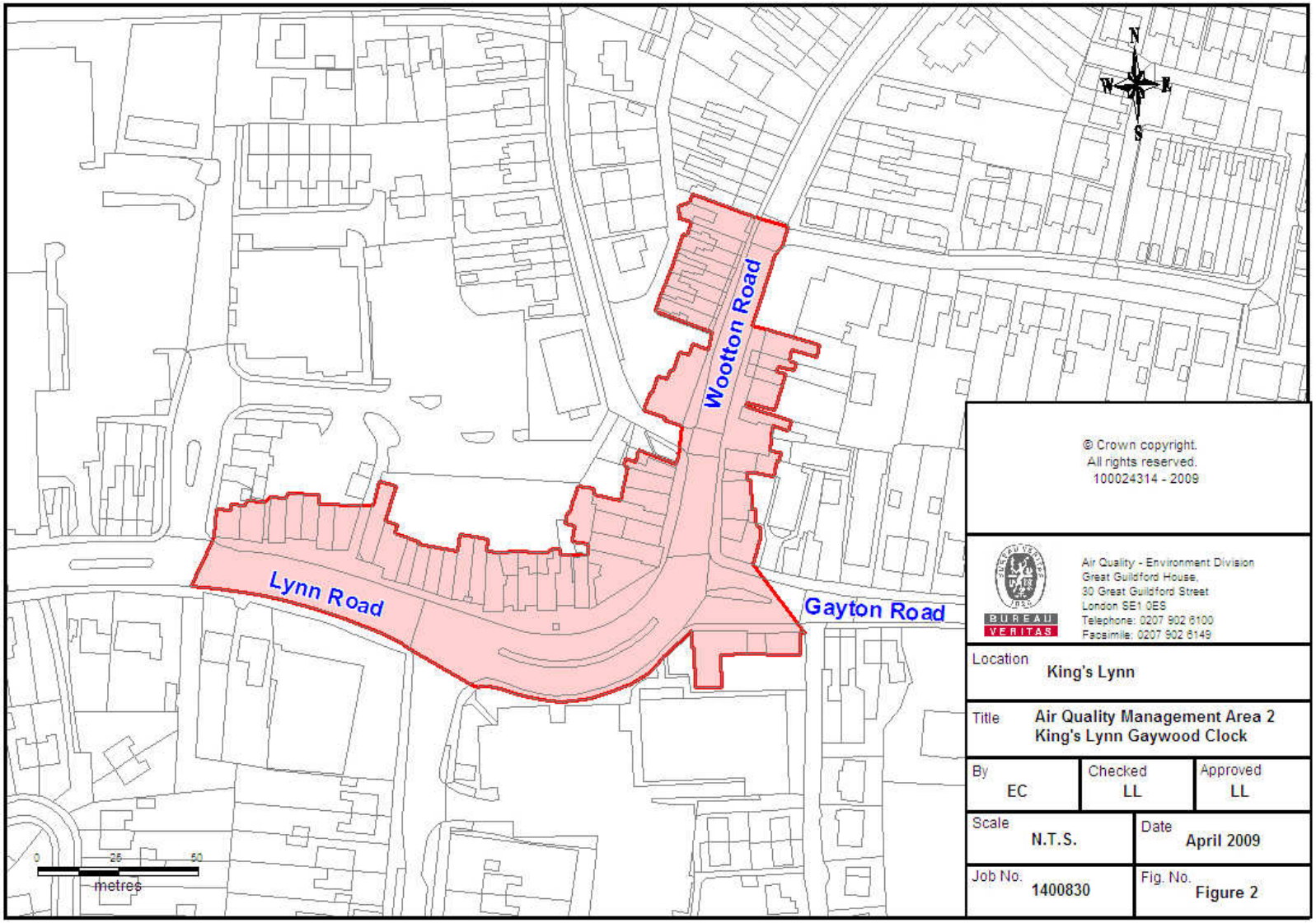


Figure 2 – King's Lynn AQMA 2 – Gaywood Clock



2 New Monitoring Data

2.1 Summary of Monitoring Undertaken

2.1.1 Automatic Monitoring Sites

The Borough Council of King's Lynn and West Norfolk undertook continuous monitoring of pollutants at two locations during 2010: in Southgates, King's Lynn and in the village of Leziate near a sand quarry site. These sites are shown in Figure 3 and Figure 4.

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.

The Leziate monitoring station was established in July 2009 off Station Road near the sand quarry site entrance. The station comprises a TEOM PM_{10} analyser.

In 2010 the Council also monitored particulate levels based on Osiris dust and particle analysers installed at sites in the borough in the villages of Stoke Ferry and Ashwicken near industrial sites. An Osiris unit is also installed at Page Stair Lane to monitor dust from King's Lynn Docks. However no data is available for 2010.

Further details of these monitoring stations are provided in Table 2.

Table 2 - Details of Automatic Monitoring Sites

Site Name	Site Type	OS Grid Ref		Pollutants Monitored	Monitoring Technique	In AQMA ?	Relevant Exposure? (Y/N with distance (m) to relevant exposure)	Distance to Kerb of Nearest Road (N/A if not applicable)	Does this Location Represent Worst-case Exposure?
King's Lynn Southgates	Roadside	562227	319198	NO_2, PM_{10}	Chemiluminescence, TEOM	Yes (NO_2)	No – property façade 4m from kerb further north	5m	No
Leziate	Industrial	567090	318257	PM_{10}	TEOM	No	No	41m	No
Furlong Road, Stoke Ferry	Industrial	570339	300083	TSP, PM_{10}, $PM_{2.5}$, PM_1	Osiris	No	Yes – 5m	N/A	Yes
Ashwicken	Industrial	569211	318266	TSP, PM_{10}, $PM_{2.5}$, PM_1	Osiris	No	Yes	N/A	Yes

2.1.2 Non-Automatic Monitoring

In 2010, the Council monitored NO_2 at 77 sites in the Borough, based on 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.

Project Atmosphere, an extension of the Council's diffusion tube programme with monitoring on school premises, collected additional data until March 2011.

Overall, 27 diffusion tube sites are located in the town centre AQMA, and 5 other sites are within the Gaywood Clock AQMA.

Five new sites were installed in July 2010, all outside the AQMA boundaries:

- Site 61 – 9 Sydney Terrace, South Lynn
- Site 62 – 5 Burney Road, South Lynn
- Site 63 - Mayfield House, High Road, Saddlebow
- Site 64 – New Farm House, High Road, Saddlebow
- Site S15 – St Michael's Primary School, South Lynn

Diffusion tubes in 2010 were prepared and analysed by Gradko International Limited. The tube preparation method is 20% TEA in water. Details of the diffusion tube monitoring sites are given in Table 3.

Table 3 - Details of Non- Automatic Monitoring Sites

Site Name	Site Type	OS Grid Ref		Pollutants Monitored	In AQMA ?	Relevant Exposure? (Y/N with distance (m) to relevant exposure)	Distance to Kerb of Nearest Road (N/A if not applicable)	Does this Location Represent Worst-case Exposure?
1	Kerbside	562073	320304	NO_2	Y – Town Centre	Y - 3m	2m	Y
2	Roadside	562100	320222	NO_2	Y – Town Centre	Y - 0m	2m	Y
3	Roadside	562117	320095	NO_2	Y – Town Centre	Y - 0m	1.5m	Y
4	Kerbside	562115	320062	NO_2	Y – Town Centre	Y - 2.5m	1m	Y
5	Roadside (Bus Station)	562055	320137	NO_2	N	N	N/A	Y
6,7,8	Roadside	562113	320043	NO_2	Y – Town Centre	No but property façade 4m from kerb further north	5m	Y
9	Roadside	562227	319198	NO_2	N	No but property façade 4m from kerb in same street	4m	Y
10	Roadside	561900	319707	NO_2	Y	Y - 2.5m	3m	Y
11	Roadside	562101	319679	NO_2	Y – Town Centre	Y - 0m	3m	Y
12	Roadside	562154	319594	NO_2	Y – Town Centre	Y - 1m	3m	Y
13	Roadside	562242	319452	NO_2	Y – Town Centre	Y - 0m	4.5m	Y
14	Roadside	562264	319375	NO_2	Y – Town Centre	Y - 0.5m	4m	Y
15	Roadside	562226	319263	NO_2	Y – Town Centre	Y - 1m	0.5m	Y
16	Kerbside	562190	319102	NO_2	N	Y - 0m	5m	Y
17	Roadside	561958	318963	NO_2	N	Y - 0m	11m	Y
18	Roadside	562209	318924	NO_2	N	Y - 0m	7m	Y
19	Roadside	562266	319043	NO_2	N	Y - 0m	6m	Y

Site Name	Site Type	OS Grid Ref		Pollutants Monitored	In AQMA ?	Relevant Exposure? (Y/N with distance (m) to relevant exposure)	Distance to Kerb of Nearest Road (N/A if not applicable)	Does this Location Represent Worst-case Exposure?
20	Kerbside	562244	319261	NO_2	Y – Town Centre	Y - 0m	3.5m	Y
21	Roadside	562267	319327	NO_2	Y – Town Centre	Y - 3m	1.5m	Y
22	Roadside	562285	319386	NO_2	Y – Town Centre	Y - 0m	5m	Y
23	Roadside	562162	319614	NO_2	Y – Town Centre	Y - 0m	4.5m	Y
24	Roadside	562136	319651	NO_2	Y – Town Centre	Y - 0m	5.5m	Y
25	Urban Background	562191	319695	NO_2	N	Y - 0m	75m	Y
26	Roadside	562131	319996	NO_2	Y – Town Centre	Y - 0m	2m	Y
27	Roadside	562178	319999	NO_2	Y – Town Centre	Y - 3m	2m	Y
28	Roadside	562253	320016	NO_2	Y – Town Centre	Y - 0m	1.5m	Y
29	Kerbside	562175	320055	NO_2	N	Y - 2.5m	1m	Y
30	Kerbside	562204	320108	NO_2	N	Y - 2.5m	1m	Y
31	Kerbside	562129	320132	NO_2	Y – Town Centre	Y - 0m	2m	Y
32	Roadside	562119	320216	NO_2	Y – Town Centre	Y - 0m	2m	Y
33	Kerbside	562203	320159	NO_2	N	Y - 2.5m	0.5m	Y
34	Roadside	562244	320129	NO_2	Y – Town Centre	Y - 0m	2.5m	Y
35	Roadside	562248	320239	NO_2	Y – Town Centre	Y - 3m	1.5m	Y
36	Roadside	562219	320319	NO_2	Y – Town Centre	Y - 0m	2m	Y
37	Roadside	562257	320243	NO_2	Y – Town Centre	No	2m	Y
38	Roadside	562257	320323	NO_2	Y – Town Centre	Y - 0m	2.5m	Y
39	Roadside	562822	320427	NO_2	N	Y - 0m	7m	Y

Site Name	Site Type	OS Grid Ref		Pollutants Monitored	In AQMA ?	Relevant Exposure? (Y/N with distance (m) to relevant exposure)	Distance to Kerb of Nearest Road (N/A if not applicable)	Does this Location Represent Worst-case Exposure?
40	Roadside	563480	320470	NO_2	Y – Gaywood Clock	Y - 0m	2m	Y
41	Roadside	563478	320515	NO_2	Y – Gaywood Clock	Y - 0m	2m	Y
42	Roadside	563480	320582	NO_2	Y – Gaywood Clock	Y - 0m	3m	Y
43	Roadside	563412	320477	NO_2	Y – Gaywood Clock	Y - 0m	5m	Y
44	Roadside	563377	320484	NO_2	Y – Gaywood Clock	Y - 0m	2m	Y
45	Roadside	563202	320488	NO_2	N	Y - 0m	4.5m	Y
46	Roadside	562565	320509	NO_2	N	Y - 0m	6.5m	Y
47	Roadside	562193	320369	NO_2	Y – Town Centre	Y - 0.5m	1m	Y
48	Roadside	562180	320365	NO_2	Y – Town Centre	Y - 0m	2m	Y
49	Roadside	561881	320768	NO_2	N	Y - 0m	7m	Y
50	Urban Background	562026	321615	NO_2	N	Y - 0m	140m	Y
51	Roadside	563515	320628	NO_2	N	Y - 6m	1.5m	Y
52	Roadside	563288	320499	NO_2	N	Y - 5.5m	1m	Y
53	Roadside	546947	308215	NO_2	N	Y - 0m	2m	Y
54	Roadside	546940	308207	NO_2	N	Y - 0m	2m	Y
55	Roadside	546945	308216	NO_2	N	Y - 0m	2m	Y
56	Roadside	547235	307645	NO_2	N	Y - 0m	2m	Y
57	Roadside	562268	318411	NO_2	N	N	2.5m	Y
58	Roadside	562186	319031	NO_2	N	Y - 18m	2m	Y
59	Roadside	562111	319967	NO_2	N	Y - 0m	6.5m	Y
60	Urban Background	562080	319942	NO_2	N	Y - 1m	37m	N

Site Name	Site Type	OS Grid Ref		Pollutants Monitored	In AQMA ?	Relevant Exposure? (Y/N with distance (m) to relevant exposure)	Distance to Kerb of Nearest Road (N/A if not applicable)	Does this Location Represent Worst-case Exposure?
61	Roadside	561854	318272	NO_2	N	Y – 0m	3.5m	Y
62	Roadside	561615	318591	NO_2	N	Y – 0m	7m	Y
63	Roadside	560593	315712	NO_2	N	Y – 0m	15m	N
64	Roadside	560917	316766	NO_2	N	Y – 0m	22m	N
S1	Urban Background	562296	320278	NO_2	N	Y - 0m	N/A	Y
S2	Urban Background	562296	320278	NO_2	N	Y - 0m	N/A	Y
S3	Urban Background	564696	321958	NO_2	N	Y - 0m	N/A	Y
S4	Urban Background	563965	322509	NO_2	N	Y - 0m	N/A	Y
S5	Urban Background	562601	320516	NO_2	N	Y - 0m	N/A	Y
S6	Urban Background	563699	319679	NO_2	N	Y - 0m	N/A	Y
S7	Urban Background	563699	319679	NO_2	N	Y - 0m	N/A	Y
S8	Urban Background	563296	319988	NO_2	N	Y - 0m	N/A	Y
S9	Urban Background	563296	319988	NO_2	N	Y - 0m	N/A	Y
S10	Urban Background	562222	319576	NO_2	N	Y - 0m	N/A	Y
S11	Urban Background	562222	319576	NO_2	N	Y - 0m	N/A	Y
S12	Urban Background	562208	319493	NO_2	N	Y - 0m	N/A	Y
S13	Urban Background	562215	319502	NO_2	N	Y - 0m	N/A	Y
S14	Urban Background	562215	319502	NO_2	N	Y - 0m	N/A	Y
S15	Urban Background	561846	318514	NO_2	N	Y - 0m	N/A	Y

Figure 3 – Air Quality Monitoring Sites Around King's Lynn

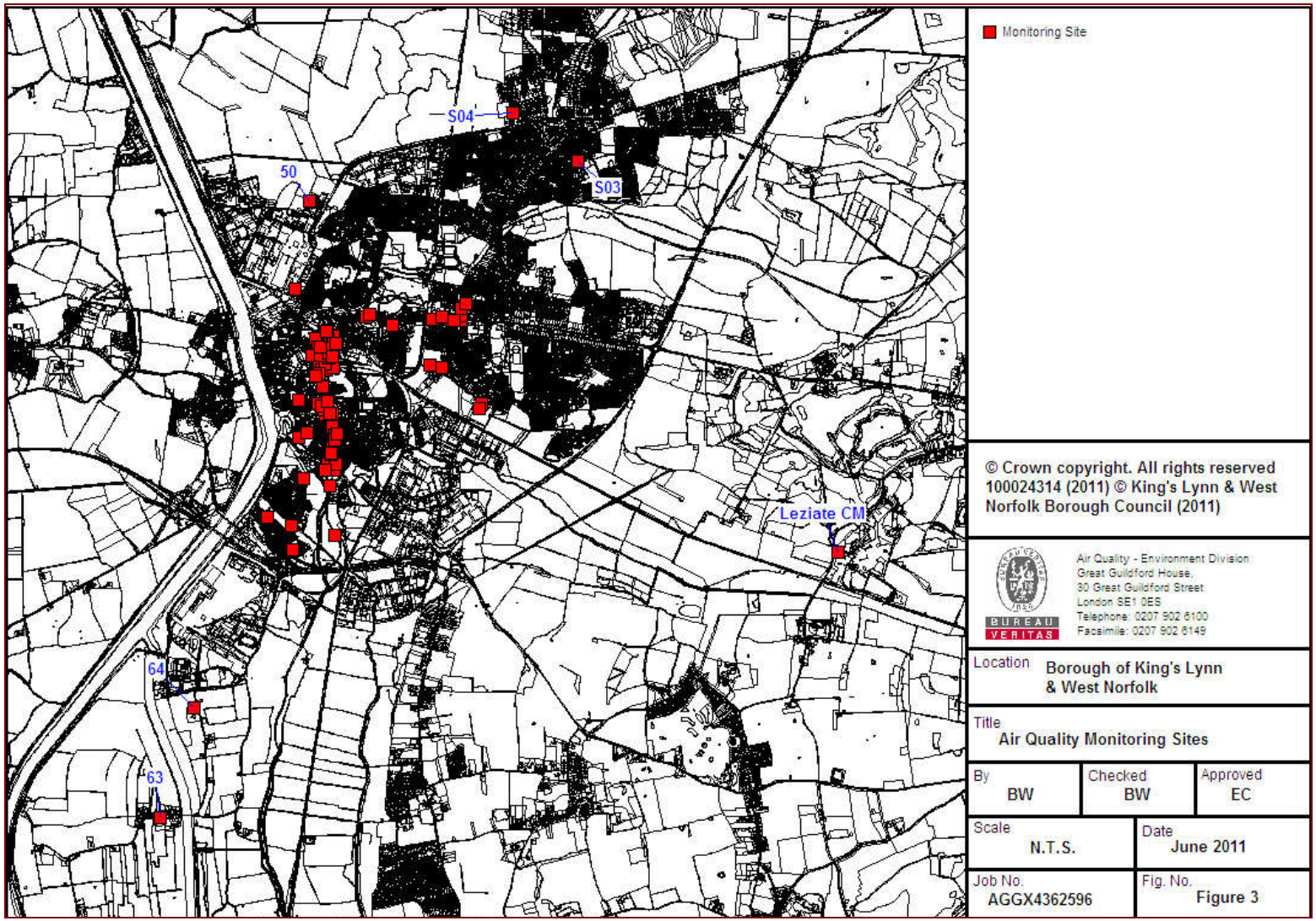


Figure 4 – Monitoring Sites in King's Lynn

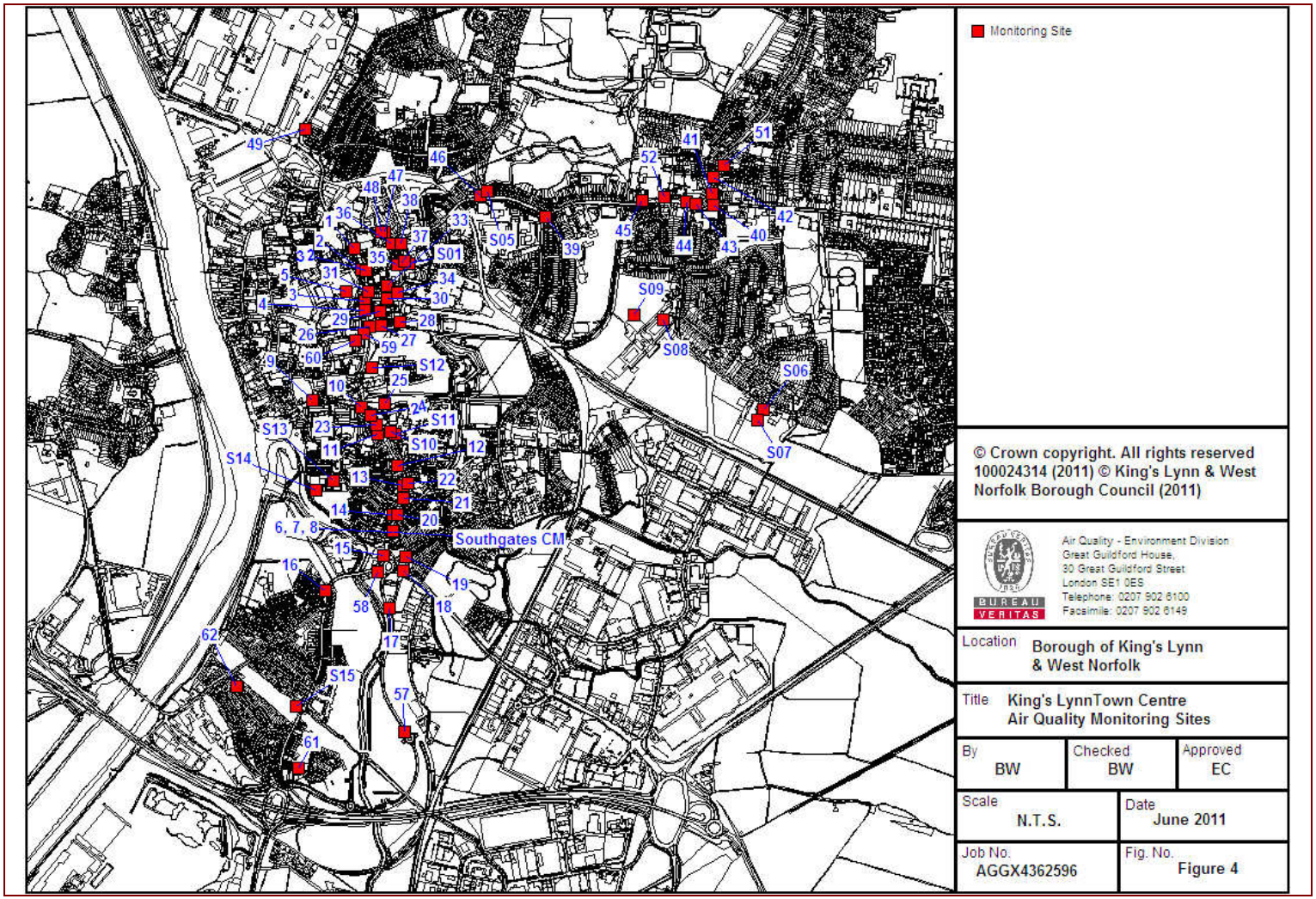
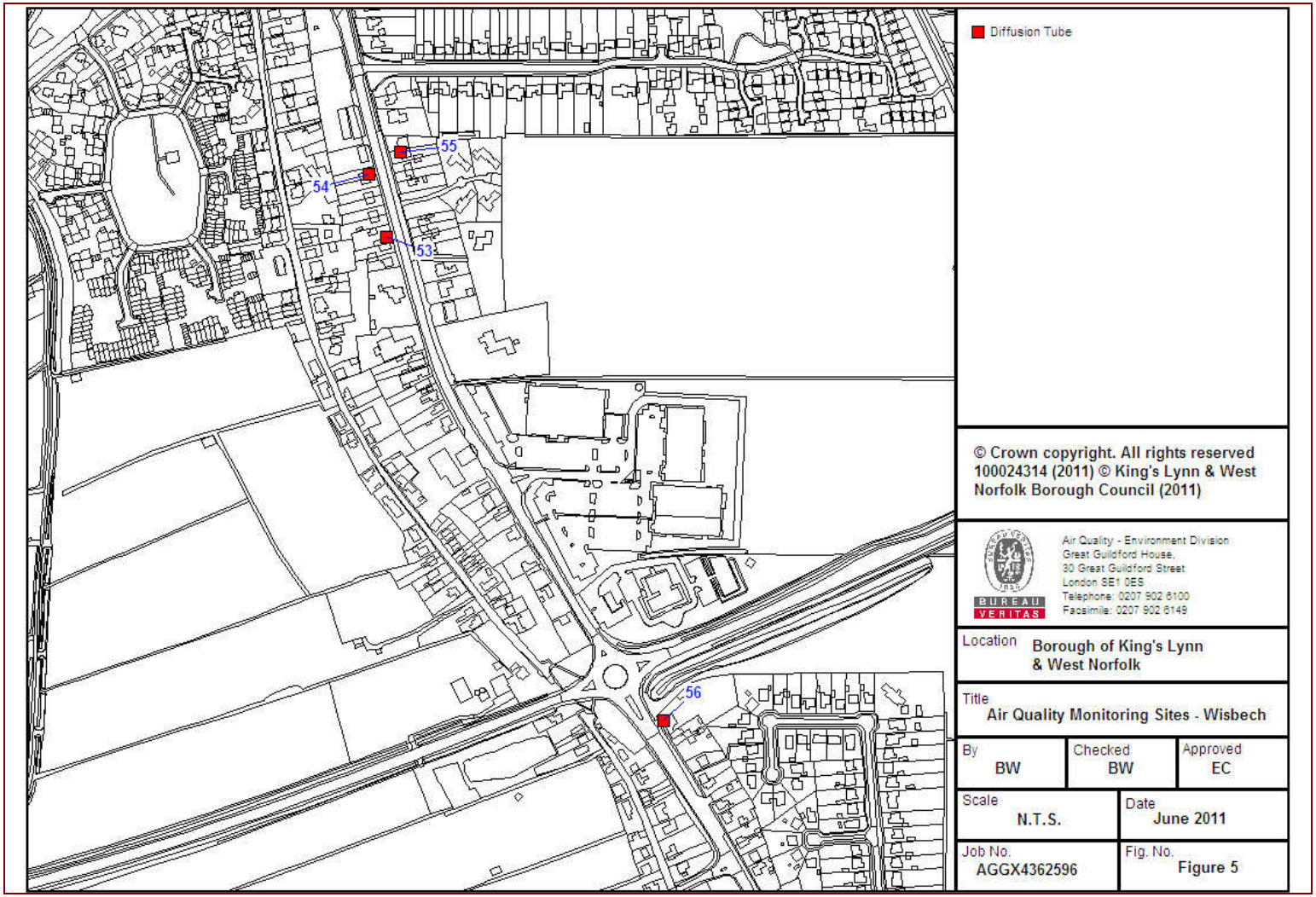


Figure 5 – Monitoring Sites in Wisbech



2.2 Comparison of Monitoring Results with Air Quality Objectives

2.2.1 Nitrogen Dioxide (NO_2)

2.2.1.1 Automatic Monitoring Data

The Council monitored NO_2 at one location during 2010 in Southgates. The ratified annual monitoring results for 2008 – 2010 for the automatic monitoring sites are shown in Table 4 and Table 5. Data capture met the 75% criterion and no annualisation was required.

Results for 2010 indicate that both the annual mean and 1-hour objectives for NO_2 were met. No exceedences of the 1-hour mean objective were recorded in 2010.

Table 4 - Results of NO_2 Automatic Monitoring - Comparison with Annual Mean Objective

Site Name	Location	Within AQMA ?	Data Capture for Monitoring Period - %	Data Capture for Full Calendar Year 2010 - %	Annual Mean Concentrations (µg/m^3)		
					2008	2009	2010
King's Lynn Continuous Monitoring Station	Southgates	Y	90	90	27.2	30.4	26.5
In bold, exceedence of the NO_2 annual mean AQS objective of 40µg/m^3							

Table 5 - Results of NO_2 Automatic Monitoring - Comparison with 1-hour Mean Objective

Site Name	Location	Within AQMA?	Data Capture for Monitoring Period - %	Data Capture for Full Calendar Year 2010 - %	Number of Hourly Means > 200 µg/m^3 *		
					2008	2009	2010
King's Lynn Continuous Monitoring Station	Southgates	Y	90	90	0	0	0
In bold, exceedence of the NO_2 hourly mean AQS objective (200 µg/m^3 – not to be exceeded more than 18 times per year)							
* If the period of valid data is less than 90% of a full year, the 99.8th percentile of hourly means is shown in brackets							

2.2.1.2 Diffusion Tube Monitoring Data

Results from NO_2 diffusion tube monitoring sites for the past three years are summarised in Table 6 below. The full data set (monthly mean values) is included in Appendix B.

For those diffusion tube sites that did not meet the 75% data capture criterion in 2010, concentrations have been annualised to estimate the annual mean for 2010. The details of annualisation are given in Appendix A. Results at these sites are subject to greater uncertainty.

A bias adjustment factor has been applied to the data, which is an estimate of the difference between diffusion tube concentrations and continuous monitoring concentrations, the latter assumed to be a more accurate method of monitoring. The LAQM.TG(09) and the LAQM Support website recommend the use of a local bias adjustment factor where available and relevant to diffusion tube sites. The Council has triplicate diffusion tubes collocated at their continuous NO_2 analyser at Southgates, which have been used to derive a local bias adjustment factor. For 2008 and 2009 data, the bias adjustment factors have been taken from the Council's previous LAQM annual reports. Details of the 2010 bias adjustment calculation are given in Appendix A.

Five sites recorded annual mean concentrations which exceed the 40µg/m³ objective, these are marked in bold. These sites are all located within the existing AQMAs, which confirms that both AQMAs should remain.

With regard to the short term objective; there is a potential risk of exceedence where the annual mean concentration is greater than 60µg/m³. There are no monitoring locations which recorded such concentrations and therefore it is expected that the short-term objective is being met.

Table 6 - Results of Nitrogen Dioxide Diffusion Tube Monitoring

Site ID	Location	Within AQMA ?	Data Capture for Monitoring Period - %	Data Capture for Full Calendar Year 2010 - %	Annual Mean Concentrations (µg/m^3)		
					2008 (Bias: 0.88)	2009 (Bias: 0.97)	2010 (Bias: 0.88)
1	Railway Road 1	Y	100	100	**44.4**	**46.7**	37.4
2	Railway Road 4	Y	100	100	**51.5**	**56.6**	**46.8**
3	Railway Road 5	Y	100	100	**46.8**	**53.1**	**45.6**
4	Railway Road 6	Y	100	100	37.5	**41.1**	38.3
5	Bus Station 1	N	83	83	**40.0**	**41.6**	38.1
6/7/8	Southgates Monitoring Station	Y	100	100	28.9	29.5	27.1
9	Mill Fleet 1	N	100	100	23.4	24.4	24.6
10	London Road 1	Y	100	100	**41.1**	**45.8**	**40.0**
11	London Road 2	Y	100	100	31.6	34.6	31.9
12	London Road 3	Y	100	100	38.5	39.6	33.5
13	London Road 4	Y	100	100	36.0	38.5	32.7
14	London Road 5	Y	100	100	39.1	37.5	37.5
15	Southgates	Y	92	92	**42.1**	**44.3**	**43.8**
16	Wisbech Rd KL	N	100	100	24.4	28.4	23.0
17	Nora 1	N	83	83	20.3	21.7	25.4
18	Hardwick Rd	N	100	100	30.0	31.5	28.4
19	Vancover Avenue 1	N	100	100	24.6	29.0	26.3

Site ID	Location	Within AQMA ?	Data Capture for Monitoring Period - %	Data Capture for Full Calendar Year 2010 - %	Annual Mean Concentrations (µg/m^3)		
					2008 (Bias: 0.88)	2009 (Bias: 0.97)	2010 (Bias: 0.88)
20	London Road 10	Y	100	100	32.2	36.2	33.7
21	London Road 11	Y	100	100	34.6	39.1	33.7
22	London Road 6	Y	92	92	37.2	38.8	38.6
23	London Road 7	Y	100	100	35.5	35.9	39.0
24	London Road 8	Y	100	100	32.2	36.6	34.1
25	The Walks	N	92	92	18.8	20.1	17.9
26	Railway Road 7	Y	100	100	**40.7**	**43.0**	37.8
27	St John's Terrace	Y	83	83	31.9	37.7	33.8
28	St John's Terrace/Blackfriar's	Y	83	83	33.9	36.8	29.5
29	Waterloo Street	N	75	75	24.8	25.8	23.5
30	Portland Street	N	75	75	25.2	28.4	24.4
31	Railway Road 2	Y	58	58	36.8	**43.5**	38.5
32	Railway Road 3	Y	100	100	33.8	37.9	33.4
33	Wellsley Street	N	83	83	32.7	35.2	30.7
34	Blackfriars 2	Y	100	100	35.4	39.4	32.9
35	Blackfriars 1	Y	92	92	33.1	37.6	34.3
36	Norfolk Street	Y	100	100	34.9	36.9	30.8
37	Blackfriars 3	Y	100	100	32.1	37.4	34.0
38	Littleport Street	Y	100	100	39.5	**44.5**	37.5
39	Gaywood Road 2	N	100	100	27.8	31.5	29.0
40	The Swan Gayton Road	Y	100	100	36.6	39.0	33.7
41	Wootton Road 2	Y	92	92	**40.4**	**45.1**	**42.4**
42	Wootton Road 1	Y	100	100	31.6	35.4	31.2
43	Lynn Road 1	Y	100	100	30.0	32.7	32.0
44	Lynn Road 2	Y	100	100	34.1	38.6	35.8
45	Gaywood Road 3	N	100	100	30.8	33.3	34.4
46	Gaywood Road 1	N	100	100	28.2	30.4	28.7
47	Austin Street 1	Y	100	100	**41.0**	**43.8**	39.5
48	Austin Street 2	Y	100	100	33.4	38.3	30.6
49	Edward Benefer Way	N	100	100	24.1	24.5	22.0
50	Kilham's Way	N	100	100	14.2	15.1	12.8
51	Wootton Road 3	N	100	100	21.4	23.6	20.5
52	Lynn Road 3	N	100	100	30.7	37.0	32.1
53	Wisbech Rd Elm 3	N	92	92	26.9	31.1	28.7
54	Wisbech Rd Elm 4	N	100	100	23.8	28.2	25.1
55	Wisbech Rd Elm 5	N	100	100	20.0	21.9	21.9
56	Wisbech Road Elm 2	N	100	100	28.7	31.8	31.7
57	NORR 1	N	92	92	24.4	27.3	24.1
58	NORR 2	N	92	92	30.8	34.3	29.1
59	St James 1	N	100	100	-	**42.8**	38.7
60	St James 2	N	100	100	-	27.8	23.5
61	9 Sydney Terrace	N	100	42	-	-	17.2
62	5 Burnley Road	N	100	42	-	-	18.8
63	Mayfield House, Lynn Road	N	100	42	-	-	13.7
64	New Farm House, High Road, Saddlebow	N	100	42	-	-	12.2

Site ID	Location	Within AQMA ?	Data Capture for Monitoring Period - %	Data Capture for Full Calendar Year 2010 - %	Annual Mean Concentrations (µg/m^3)		
					2008 (Bias: 0.88)	2009 (Bias: 0.97)	2010 (Bias: 0.88)
S1	Eastgate 1 Primary School	N	100	100	20.0	21.8	19.3
S2	Eastgate 2 Primary School	N	100	100	26.1	25.6	24.2
S3	Reffley Community School	N	92	92	14.8	17.5	16.2
S4	South Wootton Junior School	N	75	75	16.8	18.1	17.0
S5	Highgate Primary School	N	100	100	26.2	26.0	24.0
S6	Howard 1 Junior School	N	100	100	15.3	14.9	13.6
S7	Howard 2 Junior School	N	92	92	15.5	15.2	14.7
S8	Park 1 High School	N	92	92	15.1	16.7	15.9
S9	Park 2 High School	N	92	92	16.1	19.1	16.7
S10	Greyfriars 1 Primary School	N	100	100	22.2	23.0	20.1
S11	Greyfriars 2 Primary School	N	100	100	21.5	21.9	18.8
S12	Nursery School	N	100	100	23.8	25.3	22.8
S13	Whitefriars 1 Primary School	N	100	100	17.5	18.5	16.1
S14	Whitefriars 2 Primary School	N	100	100	16.5	17.0	17.3
S15	St Michael's Primary School		100	42	-	-	17.2

In bold, exceedence of the NO_2 annual mean AQS objective of 40µg/m^3

2.2.2 Particulates (PM_{10})

The Council undertook monitoring of PM_{10} based on TEOM analysers at two locations during 2010. Osiris dust and particles analysers were also installed at three locations for several months in 2010. Results for the TEOMs have been VCM[1] corrected. Result for Leziate TEOM site has also been annualised as data capture was less than 75%. Details of both the VCM correction and annualisation are provided in Appendix A.

The 2010 Results shown in Tables 7 and 8 indicate that both the PM_{10} annual mean and daily mean AQS objectives have been met at the two TEOM monitoring locations.

One daily mean exceeded 50µg/m^3 at Southgates station, and two at Leziate station. These are within the 35 exceedences per annum permitted for the PM_{10} daily mean AQS objective.

Given the greater uncertainty in Osiris monitoring results, only the estimated PM_{10} annual mean is reported. Results show compliance with the annual mean AQS objective.

Table 7 - Results of PM_{10} Automatic Monitoring - Comparison with Annual Mean Objective

Site Name	Location	Within AQMA?	Data Capture for Monitoring Period %	Data Capture for Full Calendar Year 2010 %	Annual Mean Concentrations (µg/m^3)		
					2008	2009	2010
King's Lynn Continuous Monitoring Station	Southgates	Y	89%	89%	19.0	20.1	20.8
Leziate TEOM	Station Road, Leziate	N	31%	31%	-	27.1	21.3(2)
Stoke Ferry Osiris	Furlong Road, Stoke Ferry	N	69%	69%	-	16.5	19.5
Ashwicken Osiris (1)	Ashwicken	N	100%	23%	-	-	20.3

(1) – monitoring period from 03/07/2010 to 24/09/2010
(2) - Annualised

[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 8 - Results of PM_{10} Automatic Monitoring - Comparison with 24-hour Mean Objective

Site Name	Location	Within AQMA?	Data Capture for Monitoring Period %	Data Capture for Full Calendar Year 2010 %	Number of Daily Means > 50µg/m^3		
					2008	2009	2010
King's Lynn Continuous Monitoring Station	Southgates	Y	89%	89%	1	3	1 (31.7)
King's Lynn Leziate	Leziate	N	31%	31%	-	1	2 (31.9)

In bold, exceedence of the PM_{10} daily mean AQS objective (50 µg/m^3 – not to be exceeded more than 35 times per year)

* If data capture < 90%, the 90.4th percentile of daily means is included in brackets

2.2.3 Summary of Compliance with AQS Objectives

The Borough Council of King's Lynn & West Norfolk undertook monitoring of nitrogen dioxide using a continuous analyser at the Southgates monitoring site in the King's Lynn town centre AQMA. The 2010 results indicate concentrations of NO_2 at this location continue to meet the annual mean and short term objectives.

Monitoring of NO_2 using diffusion tubes was undertaken at 77 sites across the borough in 2010; including five new sites. Five sites exceeded the annual mean objective, all of which were within the AQMAs.

The Council also monitored PM_{10} at the Southgates monitoring station and at the Leziate monitoring station near the sand quarry. Concentrations of PM_{10} continued to meet the annual mean and 24-hour mean objectives at both sites.

The Borough Council of King's Lynn & West Norfolk has examined new results from monitoring in the borough for the year 2010. Concentrations outside of the King's Lynn AQMAs are all below the objectives at relevant locations, therefore there is no need to proceed to a Detailed Assessment.

3 New Local Developments

3.1 Road Traffic Sources

Progress has been made on a package of transport improvements in King's Lynn, paid for through the grant from the Government's Community Infrastructure Fund (CIF).

The work included the reconstruction of the Southgates roundabout which started in early 2010 and culminated in a weekend closure in June when nearly 1,000 tonnes of asphalt was laid. This improvement, increasing capacity and providing better cycling and pedestrian facilities at this critical junction, cost £1.8m and was one of the projects made possible after Norfolk County Council and the Borough Council of King's Lynn & West Norfolk secured £5.3m in CIF grant from the Government.

The bus-only route between Wisbech Road and Boal Quay also became operational in April 2011. The air quality assessment produced in support of this route concluded that it would have a beneficial impact on the existing AQMA by reducing the number of car trips into the Railway Road Air Quality Management Area by encouraging modal shift and improving the reliability, journey times and quality of the public transport service.

Other CIF-funded measures within the town have included:

- Improvements to cycle links and crossings
- Development of bus priority measures in the town centre
- Junction improvements with Select Vehicle Detection for buses to improve journey time reliability

3.2 Other Transport Sources

The Borough Council of King's Lynn & West Norfolk confirms there are no new other transport sources that have been identified since the 2009 Updating and Screening Assessment.

3.3 Industrial Sources

The power engine for the on-site generation of electricity from recovered waste cooking oil and the installation of a 10m exhaust stack at Freedom Farm, Hockwold is now operational. The environmental permit application was supported by a dispersion modelling study which concluded that the proposed 10m stack height would enable adequate dispersion so that air quality objectives would not be exceeded.

3.4 Commercial and Domestic Sources

The Borough Council of King's Lynn & West Norfolk confirms there are no new commercial sources that have been identified since the 2010 APR.

3.5 New Developments with Fugitive or Uncontrolled Sources

The Borough Council of King's Lynn & West Norfolk confirms there are no new developments with fugitive or uncontrolled sources that have been identified since the 2010 APR.

The Borough Council of King's Lynn & West Norfolk has identified the following new or previously unidentified local developments which may impact on air quality in the Local Authority area:

- Reconstruction of Southgates roundabout.
- Bus route between Wisbech Road and Boal Quay
- Freedom Farm MRF Engine in Hockwold

These will be taken into consideration in the next Updating and Screening Assessment, scheduled for 2012.

4 Planning Applications

An application was received for 500 dwellings east of Elm High Road, Wisbech. The application included an air quality assessment which considered the potential increased traffic from the development and used local diffusion tube data to verify the model. However the application was not granted planning consent. The Council has diffusion tubes located close to the site south of Fenland Council's AQMA and will continue to monitor at this location.

Two applications were received for new supermarkets (Tesco and Sainsbury) off Hardwick Road in King's Lynn approximately 3km from the King's Lynn town centre and Gaywood AQMAs. The Tesco application included an Air Quality Assessment. The Assessment concluded that effects on air quality could arise from construction however mitigation could reduce the risk to medium / low. The predicted effect on air quality from traffic changes was reported to be negligible.

An air quality assessment was received for a major residential development on Wootton Road approximately 1km north of the Gaywood AQMA. The development was predicted to contribute only 2% of existing traffic flow and therefore considered only the impact on end users from traffic using the A148 Wootton Road. The report concluded that mitigation measures should be employed to reduce the dust impact from construction activities. The report further stated that predicted concentrations of NO_2 and PM_{10} locally do not exceed the AQS objectives.

Pre-application consultation has taken place regarding an Energy from Waste facility to the South West of King's Lynn at the Willows Business Park, Saddlebow Road. A planning application together with air quality assessment and health impact assessment was submitted early in 2011. This air quality assessment will be subject to expert review prior to any decisions being made. Particular attention will be paid to the cumulative impact of the proposed plant with the other facilities, such as power stations on the Saddlebow Industrial Estate.

Pre application discussions have also been held with British Sugar regarding a biogas plant and with Palm Paper in January 2011 regarding a new gas powered Combined Heat and Power plant.

Progress on these potential developments in relation to their impacts on air quality will be reviewed in the 2012 Updating and Screening Assessment.

5 Air Quality Planning Policies

The Council's Local Development Framework (LDF) documents are currently under development. The Core Strategy was available for consultation from 2010. The Core Strategy proposed submission document included policy CS11 Transportation, which states that priority will be given to:

- Implementing the King's Lynn Area Land Use and Transportation Strategy (KLATS) schemes, including delivering a package of transport improvements within King's Lynn arising from the KLATS. This will involve balancing 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.

6 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.

Connecting Norfolk contains the following policies relating to the reduction of transport emissions:

- **Policy 8: Vehicle Efficiency**

The priority for reducing emissions should be to support a shift to more efficient vehicles, including lower carbon technology and cleaner fuels; this includes the development and facilitation of necessary infrastructure.

- **Policy 9: Travel Choice**

Emphasis should be on enhancing travel choice where options offer a viable alternative to single occupancy car travel and potential for modal shift. Improving and promoting active travel options (walking and cycling in particular) for short journeys to schools, services and places of employment in market towns and urban areas should be the priority.

- **Policy 10: Air Quality Management Areas**

The first priority in town centres and urban areas should be to reduce the level of traffic or, if as a result of heavy polluters like buses, to work with operators to reduce emission levels in Air Quality Management Areas. Where a solution is required that will take many years to implement, measures like pollution barriers should be investigated in the short term to enhance the liveability of the area.

7 Climate Change Strategies

The Norfolk Climate Partnership produced a Climate Change Strategy – "*Tomorrow's Norfolk Today's Challenge*" in 2009. The Norfolk Climate Partnership comprises all the local authorities within Norfolk including King's Lynn & West Norfolk. The Borough is a signatory of the Nottingham Declaration on Climate Change.

Norfolk is particularly vulnerable to the effects of climate change due to the low-lying geology. The predicted impacts of sea level rise, tidal surges and extreme weather events need to be considered in planning decisions.

This Strategy aims to provide the vision and drive for Norfolk to tackle climate change. The vision set out in this Strategy is just the first step, it provides a framework for partnership working and community engagement, and as such it is central to delivering the "Environmentally Responsible" theme in Norfolk Ambition, our Sustainable Community Strategy.

Many businesses already recognise the economic opportunity of reducing energy consumption, but more can be done to reduce emissions from households, business and other sectors, including transport. The scale of housing growth planned for Norfolk and the county's high level of reliance on the car pose particular challenges. Action on climate change also presents a significant opportunity for Norfolk's renewables sector, as new markets are created in low-carbon energy technologies and other low carbon goods and services.

In its 'Environmental Statement 2008 – 2011', the Borough Council of King's Lynn & West Norfolk outlined key areas for a low carbon borough based around a number of the National Indicators. The Environmental Statement is updated every year to include progress on the key areas and National Indicators.

8 Implementation of Action Plans

The Railway Road AQMA was declared in 2003 and extended following the expansion of the AQMA into Austin Street, Blackfriars, St James Road and London Road, while the Gaywood Clock AQMA came in to effect in April 2009. King's Lynn and West Norfolk Borough Council are working with Norfolk County Council to examine ways in which the traffic related air pollution can be mitigated. An Action Plan to reduce traffic-related air pollution and work towards compliance with the Air Quality Strategy objectives will then be produced.

An air quality action plan group has been formed containing members from both Borough and County Councils, representing environment, regeneration, leisure and public space, planning and transport planning. This group will agree measures and draft the Action Plan.

9 Conclusions and Proposed Actions

A summary of the conclusions regarding new monitoring data and development updates is provided in the following section, along with any proposed actions.

9.1 Conclusions from New Monitoring Data

In 2010, the Borough Council of King's Lynn and West Norfolk has undertaken real-time monitoring in Southgates (for NO_2 and PM_{10}), in Leziate near the sand quarry (for PM_{10} only) and in Ashwicken and Stoke Ferry (PM_{10}). Results at all of these monitoring sites show that the Air Quality Strategy objectives are being met.

The 2010 results from the network of NO_2 diffusion tubes installed across the borough show that 5 sites exceeded the annual mean NO_2 objective of 40µg/m^3, all of these are within King's Lynn AQMAs. No exceedences of the NO_2 objectives were monitored outside AQMAs, and therefore, no Detailed Assessment is required.

9.2 Conclusions relating to New Local Developments

The bus-only route between Wisbech Road and Boal Quay is now operational. An air quality assessment completed for this scheme concluded that the impact would be beneficial on the King's Lynn town centre AQMA. Southgates roundabout has also been reconstructed, increasing capacity and providing better cycling and pedestrian facilities at this critical junction.

The Freedom Farm MRF Engine in Hockwold is now operational. The air quality assessment was carried out for this development concluded that the engine would lead to no breach of the UK air quality objectives.

9.3 Proposed Actions

- Continue with current continuous automatic monitoring programme for NO_2 at Southgates Road in King's Lynn;
- Continue with NO_2 diffusion tube monitoring in the Borough, especially in the King's Lynn AQMAs and along other parts of the town centre outside the AQMAs;
- Develop Action Plans to work towards compliance with the air quality objectives within the two AQMAs. These plans should draw upon the results of the Further Assessments of the AQMAs which will provide information about the pollutant reductions required to comply with the objectives and source contributions in each area;
- Progress to a 2012 Updating and Screening Assessment, to be completed by April 2012.

10 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

- Local Air Quality Management Policy Guidance LAQM.PG(09). February 2009. Published by Defra in partnership with the Scottish Government, Welsh Assembly Government and Department of the Environment Northern Ireland

- Diffusion Tubes for Ambient NO_2 Monitoring: Practical Guidance for Laboratories and Users, Report to Defra and the Devolved Administrations , February 2008

- Borough of King's Lynn & West Norfolk Annual Progress Report 2010.

- Climate Change Strategy - Tomorrow's Norfolk Today's Challenge. Norfolk Climate Change Partnership, February 2009.

- Borough of King's Lynn & West Norfolk Environmental Statement 2008 – 2011

- Core Strategy – Proposed Submission Document (2010). Borough Council of King's Lynn & West Norfolk, November 2010.

- Regenerating King's Lynn: Growth Point and the Urban Development Strategy. Borough of King's Lynn & West Norfolk May 2009.

- Connecting Norfolk – Norfolk's Transport Plan for 2026. April 2011

Appendices

Appendix A: QA:QC Data

Diffusion Tube Bias Adjustment Factors

The diffusion tubes are supplied and analysed by Gradko Laboratories using the 20% v/v Triethanolamine (TEA) in water preparation method. Bias adjustment factors for 2008 and 2009 have been taken from the 2010 Progress Report.

Factor from Local Co-location Studies

Tubes are co-located at the Southgates continuous monitoring station. The local bias adjustment factor calculated was 0.88 in 2010. The summary of the bias calculations is shown in Table 9.

Table 9 - Summary of Bias Adjustment calculation

Kings Lynn Southgates (based on 10 periods of data)	
Bias factor A	0.88 (0.78 – 1.01)
Bias B	14% (-1% - 29%)
Diffusion Tubes Mean:	30 µg/m³
Automatic Mean:	27µg/m³
Data Capture for periods used:	95%
Adjusted Tubes Mean:	30 (24-31) µg/m³

Discussion of Choice of Factor to Use

With regard to the application of a bias adjustment factor for the diffusion tubes, Technical Guidance LAQM.TG(09) and the LAQM Support website recommend the use of a local bias adjustment factor where available and relevant to diffusion tube sites. The co-location site, as in previous review and assessment stages, has been used to derive a local bias correction factor. As a comparison, the default bias correction from the national bias adjustment spreadsheet [2] (version 04/11) for this laboratory and preparation method is 0.92 for year 2010.

[2] National Diffusion Tube Bias Adjustment Factor Spreadsheet v 04/11 – Available for download at http://laqm.defra.gov.uk/

PM_{10} Monitoring Adjustment

The Borough Council of Kings Lynn and West Norfolk operate two TEOMs within the Borough. The data have been VCM corrected before assessing compliance against the objectives. Summaries of the settings the VCM model used to correct the data are shown Table 10 and Table 11.

Table 10 - Summary of VCM Settings - Southgates

Summary	
Site Name	**King's Lynn Southgates**
Organisation	**BC of King's Lynn & West Norfolk**
Start Date	01/01/2010
End Date	31/12/2010
TEOM data already corrected with 1.3 factor	Yes
EPA Constant A	3
EPA Constant B	1.03
Instrument Temperature	25
Instrument Pressure	1013
Instrument reports to local ambient readings	Yes
Timescale	Hourly
Pressure Site	
Pressure Site Warning	
Temperature Site	
Temperature Site Warning	
FDMS Site 1	Norwich Lakenfields AURN (NW2)
FDMS Site 1 Warning	FDMS1 Data capture 77%.
FDMS Site 2	Central Beds - Sandy (MD3)
FDMS Site 2 Warning	FDMS2 Data capture 86%.
FDMS Site 3	Average of remaining sites within range
FDMS Site 3 Warning	

Table 11 - Summary of VCM Settings - Leziate

Summary	
Site Name	**King's Lynn Leziate**
Organisation	**BC of King's Lynn & West Norfolk**
Start Date	01/01/2010
End Date	31/12/2010
TEOM data already corrected with 1.3 factor	Yes
EPA Constant A	3
EPA Constant B	1.03
Instrument Temperature	25
Instrument Pressure	1013
Instrument reports to local ambient readings	Yes
Timescale	Hourly
Pressure Site	
Pressure Site Warning	
Temperature Site	
Temperature Site Warning	
FDMS Site 1	Norwich Lakenfields AURN (NW2)
FDMS Site 1 Warning	FDMS1 Data capture 77%.
FDMS Site 2	Central Beds - Sandy (MD3)
FDMS Site 2 Warning	FDMS2 Data capture 86%.
FDMS Site 3	Average of remaining sites within range
FDMS Site 3 Warning	

Short-term to Long-term Data Adjustment

Automatic Monitoring: Data capture for PM_{10} at King's Lynn Leziate monitoring was significantly less than 75% in 2010 and has been annualised. The period VCM-corrected annualised mean is 21.3µg/m³. Annualisation followed procedures in Box 3.2 of LAQM.TG(09); a summary of the sites and factors is shown in Table 12.

Table 12 - Summary of Annualisation of King's Lynn Leziate PM_{10} Data

Site	Site Type	Annual Mean	Period Mean	Ratio
Leicester Centre	Urban Background	18.78	18.16	1.03
Chesterfield	Urban Background	19.91	17.87	1.11
Norwich Lakenfields	Urban Background	17.88	16.68	1.07
Average				1.07

Non-Automatic Monitoring:

Six diffusion tube monitoring locations did not achieve a data capture of 75% in 2010, including the new tubes which were operational from August 2010 and therefore did not cover a full calendar year. A summary of the sites used and the annualisation factors is shown in Table 13.

Table 13 - Summary of Annualisation – Diffusion Tubes

Site	Uncorrected Diffusion Tube Concentration (µg/m^3)	Annualisation Factor					Annualised Concentration (µg/m^3) (Uncorrected for Bias)
		Leamington Spa	Northampton	Chesterfield	Leicester	Average	
Railway Road 2	43.7	1.000	1.000	1.000	1.000	1.000	43.7
9 Sydney Terrace	20.8	0.953	0.930	0.929	0.944	0.939	19.5
5 Burney Road	22.8	0.953	0.930	0.929	0.944	0.939	21.4
Mayfield House Lynn Road	16.6	0.953	0.930	0.929	0.944	0.939	15.6
New Farm House, High Road, Saddlebow	14.8	0.953	0.930	0.929	0.944	0.939	13.9
St Michael's	20.8	0.953	0.930	0.929	0.944	0.939	19.5

QA/QC of Automatic Monitoring

The site is 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. The data are ratified by AEA.

QA/QC of diffusion Tube Monitoring

Gradko Laboratories participate 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. In 2010, the inter-comparison rated Gradko as "Good". The full 2010 WASP rounds have not yet been made available. However, for the latest rounds (covering April 2009 to April 2010), Gradko performance was "Good".

The laboratory follows the procedures set out in the Harmonisation Practical Guidance.

Appendix B – Monitoring Data

Table 14 - 2010 Passive Monitoring Monthly Mean Measurements (µg/m^3)

Site Name	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Count	Average	Annualised	Bias Adjusted	% Data Capture
1	54.0	44.0	47.0	35.0	33.0	35.0	36.0	32.0	47.0	45.0	38.0	64.0	12	42.5		37.4	100
2	56.0	50.0	60.0	55.0	43.0	40.0	54.0	47.0	46.0	67.0	48.0	72.0	12	53.2		46.8	100
3	51.0	52.0	51.0	55.0	51.0	39.0	55.0	46.0	54.0	61.0	48.0	59.0	12	51.8		45.6	100
4	50.0	47.0	47.0	41.0	42.0	36.0	38.0	35.0	50.0	46.0	40.0	50.0	12	43.5		38.3	100
5	51.0	46.0	49.0	42.0	M	33.0	M	34.0	42.0	45.0	42.0	49.0	10	43.3		38.1	83
6,7,8	37.0	36.0	36.0	31.0	26.0	22.0	27.0	24.0	29.0	32.0	32.0	37.0	12	30.8		27.1	100
9	41.0	34.0	33.0	26.0	23.0	18.0	18.0	20.0	27.0	28.0	26.0	42.0	12	28.0		24.6	100
10	58.0	53.0	51.0	43.0	38.0	34.0	40.0	34.0	42.0	57.0	41.0	54.0	12	45.4		40.0	100
11	39.0	39.0	43.0	33.0	34.0	32.0	31.0	29.0	39.0	41.0	29.0	46.0	12	36.3		31.9	100
12	48.0	38.0	44.0	31.0	37.0	29.0	38.0	32.0	38.0	39.0	33.0	50.0	12	38.1		33.5	100
13	44.0	45.0	40.0	33.0	36.0	29.0	30.0	31.0	35.0	38.0	35.0	50.0	12	37.2		32.7	100
14	50.0	47.0	47.0	38.0	39.0	34.0	42.0	36.0	38.0	49.0	32.0	60.0	12	42.7		37.5	100
15	56.0	52.0	51.0	55.0	51.0	46.0	42.0	M	42.0	48.0	45.0	60.0	11	49.8		43.8	92
16	33.0	29.0	32.0	25.0	24.0	21.0	22.0	23.0	25.0	24.0	21.0	34.0	12	26.1		23.0	100
17	32.0	29.0	26.0	22.0	M	23.0	23.0	24.0	M	36.0	29.0	45.0	10	28.9		25.4	83
18	45.0	43.0	34.0	29.0	32.0	25.0	26.0	19.0	29.0	35.0	30.0	40.0	12	32.3		28.4	100
19	37.0	34.0	32.0	27.0	21.0	25.0	27.0	27.0	30.0	34.0	27.0	38.0	12	29.9		26.3	100
20	42.0	49.0	43.0	35.0	40.0	32.0	30.0	29.0	36.0	44.0	33.0	47.0	12	38.3		33.7	100
21	39.0	46.0	46.0	40.0	30.0	31.0	33.0	28.0	40.0	44.0	33.0	49.0	12	38.3		33.7	100
22	47.0	56.0	52.0	44.0	34.0	37.0	33.0	36.0	38.0	49.0	M	56.0	11	43.8		38.6	92
23	58.0	53.0	48.0	41.0	48.0	41.0	32.0	34.0	38.0	44.0	44.0	51.0	12	44.3		39.0	100
24	45.0	45.0	47.0	37.0	46.0	32.0	27.0	29.0	35.0	41.0	35.0	46.0	12	38.8		34.1	100
25	27.0	24.0	24.0	15.0	13.0	12.0	16.0	17.0	M	25.0	21.0	30.0	11	20.4		17.9	92
26	52.0	46.0	39.0	41.0	43.0	39.0	39.0	36.0	40.0	43.0	41.0	57.0	12	43.0		37.8	100

Site Name	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Count	Average	Annualised	Bias Adjusted	% Data Capture
27	40.0	40.0	37.0	36.0	39.0	33.0	35.0	38.0	M	M	35.0	51.0	10	38.4		33.8	83
28	42.0	40.0	36.0	M	29.0	13.0	32.0	36.0	M	32.0	27.0	48.0	10	33.5		29.5	83
29	32.0	Missing	27.0	20.0	M	M	21.0	23.0	25.0	26.0	28.0	38.0	9	26.7		23.5	75
30	Missing	34.0	33.0	30.0	23.0	20.0	20.0	23.0	M	M	26.0	41.0	9	27.8		24.4	75
31	Missing	51.0	44.0	41.0	41.0	36.0	32.0	M	M	M	M	61.0	7	43.7	43.7	38.5	58
32	45.0	42.0	47.0	35.0	37.0	29.0	32.0	32.0	37.0	39.0	32.0	48.0	12	37.9		33.4	100
33	40.0	39.0	38.0	32.0	30.0	27.0	31.0	M	33.0	35.0	M	44.0	10	34.9		30.7	83
34	44.0	37.0	42.0	33.0	36.0	30.0	36.0	31.0	38.0	39.0	33.0	50.0	12	37.4		32.9	100
35	38.0	Missing	77.0	33.0	36.0	30.0	32.0	33.0	37.0	34.0	32.0	47.0	11	39.0		34.3	92
36	39.0	39.0	42.0	31.0	31.0	28.0	31.0	29.0	38.0	38.0	30.0	44.0	12	35.0		30.8	100
37	48.0	46.0	38.0	36.0	41.0	38.0	28.0	32.0	37.0	38.0	35.0	46.0	12	38.6		34.0	100
38	50.0	53.0	54.0	35.0	35.0	37	38.0	34.0	44.0	40	38.0	54.0	12	42.7		37.5	100
39	35.0	41.0	35.0	30.0	30.0	24.0	34.0	27.0	32.0	38.0	29.0	40.0	12	32.9		29.0	100
40	38.0	37.0	51.0	38.0	33.0	30.0	42.0	36.0	37.0	39.0	32.0	46.0	12	38.3		33.7	100
41	59.0	56.0	60.0	34.0	52.0	34.0	41.0	M	43.0	54.0	42.0	55.0	11	48.2		42.4	92
42	38.0	34.0	42.0	36.0	34.0	30.0	35.0	31.0	33.0	35.0	34.0	43.0	12	35.4		31.2	100
43	37.0	43.0	40.0	35.0	39.0	30.0	31.0	34.0	31.0	42.0	32.0	43.0	12	36.4		32.0	100
44	48.0	46.0	49.0	40.0	40.0	31.0	31.0	33.0	38.0	40.0	40.0	52.0	12	40.7		35.8	100
45	51.0	49.0	41.0	37.0	42.0	33.0	31.0	29.0	33.0	36.0	37.0	50.0	12	39.1		34.4	100
46	41.0	40.0	35.0	32.0	32.0	24.0	25.0	25.0	29.0	39.0	31.0	39.0	12	32.7		28.7	100
47	47.0	52.0	51.0	43.0	43.0	42.0	38.0	39.0	40.0	48.0	40.0	55.0	12	44.8		39.5	100
48	43	37	40	35	24	27	31	29	31	43	33	44	12	34.8		30.6	100
49	32	29	25	23	19	18	20	21	23	27	26	37	12	25.0		22.0	100
50	8	19	17	11	8	6	10	30	13	16	16	21	12	14.6		12.8	100
51	31	29	27	21	19	13	19	18	22	28	22	30	12	23.3		20.5	100
52	41	41	43	38	40	27	30	30	35	35	37	41	12	36.5		32.1	100

Site Name	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Count	Average	Annualised	Bias Adjusted	% Data Capture
53	31	35	40	32	25	M	23	25	36	40	31	41	11	32.6		28.7	92
54	39	33	32	29	24	20	18	20	28	32	30	37	12	28.5		25.1	100
55	32	30	28	24	17	15	18	20	22	28	26	38	12	24.8		21.9	100
56	45	44	43	36	31	27	29	32	31	36	35	43	12	36.0		31.7	100
57	Missing	38	31	26	21	19	16	20	27	29	34	40	11	27.4		24.1	92
58	52	47	41	M	30	20	23	22	30	30	32	37	11	33.1		29.1	92
59	46	45	56	46	40	38	37	37	40	51	40	52	12	44.0		38.7	100
60	31	32	31	23	22	19	21	20	28	29	28	37	12	26.8		23.5	100
61								15	19	18	23	29	5	20.8	19.5	17.2	42
62								16	20	22	24	32	5	22.8	21.4	18.8	42
63								9	12	14	14	34	5	16.6	15.6	13.7	42
64								9	13	16	13	23	5	14.8	13.9	12.2	42
S1	32	26	26	18	15	13	16	18	20	24	21	34	12	21.9		19.3	100
S2	34	31	30	22	20	17	24	24	24	34	31	39	12	27.5		24.2	100
S3	32	24	22	15	12	7	11	12	M	19	20	29	11	18.5		16.2	92
S4	27	22	23	13	M	M	M	11	16	19	17	26	9	19.3		17.0	75
S5	36	34	31	24	21	16	21	22	27	31	30	34	12	27.3		24.0	100
S6	22	21	18	11	9	7	10	11	14	15	20	27	12	15.4		13.6	100
S7	25	19	16	11	10	6	M	20	14	17	20	26	11	16.7		14.7	92
S8	29	25	17	14	11	9	11	M	15	18	21	29	11	18.1		15.9	92
S9	32	28	21	15	12	M	12	14	17	24	3	31	11	19.0		16.7	92
S10	30	24	26	21	14	14	21	19	21	27	26	31	12	22.8		20.1	100
S11	31	26	25	18	13	13	17	18	21	23	24	27	12	21.3		18.8	100
S12	30	29	30	22	20	17	18	23	25	31	29	37	12	25.9		22.8	100
S13	27	25	21	15	16	8	11	12	17	20	21	27	12	18.3		16.1	100
S14	30	27	22	14	14	8	11	10	17	22	21	40	12	19.7		17.3	100
S15								14	16	19	23	32	5	20.8	19.5	17.2	42