South Holland District Council
Annual Status Report 2017

Bureau Veritas

November 2017

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Document Control Sheet

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2017 Air Quality Annual Status Report (ASR)

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

November 2017

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Executive Summary: Air Quality in Our Area

Air Quality in South Holland District Council

Air pollution is associated with a number of adverse health impacts. It is recognised as a contributing factor in the onset of heart disease and cancer. Additionally, air pollution particularly affects the most vulnerable in society: children and older people, and those with heart and lung conditions. There is also often a strong correlation with equalities issues, because areas with poor air quality are also often the less affluent areas[1,2].

The annual health cost to society of the impacts of particulate matter alone in the UK is estimated to be around £16 billion[3].

The main source of air pollution in the district is road traffic emissions from major roads, notably the A16, A17 and A151 which connect South Holland with North Lincolnshire and the Humber estuary, and south west Lincolnshire. There are currently no Air Quality Management Areas (AQMAs) declared in South Holland.

During 2016, annual mean NO_2 concentrations have been recorded as under 13µg/m^3 at both automatic monitoring sites and below 30µg/m^3 at all non-automatic monitoring sites, except SH13 at Pinchbeck Road, where the annual mean concentration was reported to be 34.8 µg/m^3. An increase in the NO_2 annual mean concentration was observed in 2016 at all monitoring sites.

At both automatic monitoring sites, the annual mean PM_{10} concentrations are well below the annual mean PM_{10} AQS objective and the number of exceedances of the daily mean objective is considerably lower than the permitted 35.

ADMS screening assessments have been carried out for ten biomass boilers. There are no significant impacts from NO_2 and PM_{10} emissions from the biomass boilers at all farms except Luttongate Farm. The NO_2 emissions from the biomass boiler at Luttongate Farm cannot be screened out and a detailed assessment is required to determine the impact of emissions from the biomass boiler proposed.

[1] Environmental equity, air quality, socioeconomic status and respiratory health, 2010
[2] Air quality and social deprivation in the UK: an environmental inequalities analysis, 2006
[3] Defra. Abatement cost guidance for valuing changes in air quality, May 2013

Actions to Improve Air Quality

There are no designated AQMA's within South Holland District Council, therefore the Council has not produced any Air Quality Action Plans (AQAPs) and as such the council has not published any specific measures related to control and mitigation of sources of local air quality issues.

Conclusions and Priorities

In 2016, the annual mean NO_2 concentrations at all monitoring locations in South Holland District were below the 40µg/m^3 air quality objective. Annual mean NO_2 concentrations were recorded below 13µg/m^3 at both automatic monitoring sites and below 30µg/m^3 at all non-automatic monitoring sites, except SH13, where an annual mean concentration of 34.8µg/m^3 was recorded.

As the annual mean concentrations at all the sites are well below 60µg/m^3, this indicates that an exceedance of the 1-hour mean objective is unlikely at these sites.

South District Council's priorities for the coming year include:

- Continuing with the current NO_2 diffusion tube monitoring network to identify any exceedances of the annual mean air quality objective;
- Ensure new developments meet the requirements of planning policies and guidance in relation to air quality; and
- Proceed to the 2018 Annual Status Report.

Local Engagement and How to get Involved

A variety of actions can be undertaken by everyone to help keep air pollution low, and protect their health when levels rise:

- Don't light a bonfire when pollution levels are high.
- Try to use your car less often - walk, cycle or use public transport.
- Cycling or walking is healthier for both the environment, and for you.
- Ask your employer, school or college about developing a green travel plan.
- Do not drive your car when there are warnings of high air pollution. You will normally receive pollution warnings on your local regional news and weather forecast.

The South Holland air quality webpages can be found at http://shollandair.aeat.com/.

The website allows users to find out what the latest pollution levels in South Holland area are, find out more about air pollution, and view data for individual automatic monitoring stations in the local authority area.

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1 Local Air Quality Management

This report provides an overview of air quality in South Holland District Council during 2016. It fulfils the requirements of Local Air Quality Management (LAQM) as set out in Part IV of the Environment Act (1995) 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 an exceedance is considered likely the local authority must declare an Air Quality Management Area (AQMA) and prepare an Air Quality Action Plan (AQAP) setting out the measures it intends to put in place in pursuit of the objectives. This Annual Status Report (ASR) is an annual requirement showing the strategies employed by South Holland District Council to improve air quality and any progress that has been made.

The statutory air quality objectives applicable to LAQM in England can be found in Table E.1 in Appendix E.

2 Actions to Improve Air Quality

2.1 Air Quality Management Areas

Air Quality Management Areas (AQMAs) are declared when there is an exceedance or likely exceedance of an air quality objective. After declaration, the authority must prepare an Air Quality Action Plan (AQAP) within 12-18 months setting out measures it intends to put in place in pursuit of compliance with the objectives.

South Holland District Council currently does not have any AQMAs. For reference, a map of South District Council's monitoring locations is available in Appendix D.

2.2 Progress and Impact of Measures to address Air Quality in South Holland District Council

Defra's appraisal of last year's ASR concluded the District Council may wish to consider reviewing the current monitoring programme, in light of the 2015 results, to determine whether there may be any further locations with relevant exposure above objective levels elsewhere in the District. The 2016 monitoring data show there were no exceedances of NO_2 and PM_{10} AQS objectives.

Both NO_2 and PM_{10} AQS objectives have been met within South Holland District in the last five years. Regardless, the Council is committed to improving air quality. The South East Lincolnshire Local Plan is currently at the final consultation stage. Once the new Local Plan is in place air quality mitigation measures will be required as part of new developments that have an impact on air quality.

Across South East Lincolnshire, the focus of the Air Quality action will centre on the understanding that:

- With there now being a strong base of scientific evidence that particulates from traffic pollution are a contributor to premature death (29,000 in the UK in 2008, 25,000 of these in England), with Nitrogen Dioxide also strongly linked, there is a strong need to also avoid increasing traffic pollution at other locations that fall below the threshold for a declared AQMA, but which could potentially reach this threshold in the future if unchecked;
- Councils have a duty to ensure that the national air quality objectives are met in their area;
- National air quality objectives will evolve over time to further reduce negative impacts on human health and the environment.

With this in mind it is important that the Council is able to require further assessment by developers and apply conditions to applications / permissions, with air quality as a material consideration. It may be necessary to agree a threshold for the number of properties being developed, or the scale of non-housing developments, at which point further assessment of air quality impacts by the developer will take effect and the areas where such further assessment will be relevant. This might be one large scale development, or potentially a number of smaller developments where there is

the potential for a negative impact on air quality in a defined location. This might be where there could be impact on a particular street, or combination of streets, where the air quality objective for a particular pollutant either isn't being met, or could fail to be met in the future. Such considerations may vary to reflect changes in the levels of pollutants and the pollutants themselves, as published from time to time as national air quality objectives.

South East Lincolnshire are at a point where a large scale housing development would require an air quality assessment and proposed mitigation to be offered by the developer such as the installation of electric vehicle charge points, provision of cycle / safe pedestrian routes, bus interchanges, contributions to road improvement schemes, or combinations of these, to ensure the Council can keep control of air quality in the future.

We understand that a policy needs to exist under the local plan before such measures can be required.

Transport measures would be addressed County-wide by Lincolnshire County Council, and may include:

- Company Vehicle Procurement -Prioritising uptake of low emission vehicles;
- Priority parking for LEV's;
- Procuring alternative Refuelling infrastructure to promote Low Emission Vehicles, EV recharging, Gas fuel recharging;
- Public Vehicle Procurement -Prioritising uptake of low emission vehicles;
- Taxi emission incentives; and
- Taxi Licensing conditions.

2.3 $PM_{2.5}$ – Local Authority Approach to Reducing Emissions and/or Concentrations

As detailed in Policy Guidance LAQM.PG16 (Chapter 7), local authorities are expected to work towards reducing emissions and/or concentrations of $PM_{2.5}$ (particulate matter with an aerodynamic diameter of 2.5µm or less). There is clear evidence that $PM_{2.5}$ has a significant impact on human health, including premature mortality, allergic reactions, and cardiovascular diseases.

The Public Health Outcomes Framework indicator for the fraction of deaths attributable to $PM_{2.5}$ in South Holland District is 5.2% during 2015, which is above national average of 4.7%, but lower than a number of other authorities in the East Midlands region.

There is currently no ongoing monitoring of $PM_{2.5}$ within the District, and no specific measures in place to address $PM_{2.5}$ concentrations, as the air quality across the District is considered good. Traffic emissions are the main cause of particulate emissions within the District, and as such, the implementation of the transport measures given in Section 2.2 will contribute to reduction of $PM_{2.5}$ concentrations experienced across the District.

3 Air Quality Monitoring Data and Comparison with Air Quality Objectives and National Compliance

3.1 Summary of Monitoring Undertaken

3.1.1 Automatic Monitoring Sites

This section sets out what monitoring has taken place and how it compares with objectives.

South Holland District Council undertook automatic (continuous) monitoring at 2 sites during 2016. The PM_{10} TEOM was replaced with an Unheated Met One BAM 1020 at Spalding Monkhouse School site in March 2016. Table A.1 in Appendix A shows the details of the sites.

Maps showing the location of the monitoring sites are provided in Appendix D. Further details on how the monitors are calibrated and how the data has been adjusted are included in Appendix C.

3.1.2 Non-Automatic Monitoring Sites

South Holland District Council undertook non- automatic (passive) monitoring of NO_2 at 15 sites during 2016. Table A.2 in Appendix A shows the details of the sites.

Maps showing the location of the monitoring sites are provided in Appendix D. Further details on Quality Assurance/Quality Control (QA/QC) for the diffusion tubes, including bias adjustments are included in Appendix C. The data capture for all 17 tubes are greater than 75%, and as such there was no need to anualise any of the results.

3.2 Individual Pollutants

The air quality monitoring results provided in this section are adjusted for bias. Further details on adjustments are provided in Appendix C.

3.2.1 Nitrogen Dioxide (NO_2)

Table A.3 in Appendix A compares the ratified and adjusted monitored NO_2 annual mean concentrations for the past 5 years with the air quality objective of 40µg/m^3.

For diffusion tubes, the full 2016 dataset of monthly mean values is provided in Appendix B.

Table A.4 in Appendix A compares the ratified continuous monitored NO_2 hourly mean concentrations for the past 5 years with the air quality objective of 200µg/m^3, not to be exceeded more than 18 times per year. For the last five years, the number of exceedences for the hourly mean NO_2 objective has remained at zero.

At both automatic monitoring sites, there have been no exceedances of the hourly mean and the annual mean NO_2 objectives.

Figure A.1 shows the trends of the annual mean NO_2 concentrations recorded at both automatic and non-automatic monitoring sites during 2012 to 2016. In the last five years, the annual mean NO_2 concentrations have been below 16µg/m^3 at both automatic monitoring sites and below 30µg/m^3 at all non-automatic monitoring sites, except SH13 which reported an annual mean concentration below 35µg/m^3. The majority of the non-automatic monitoring sites show peak annual mean NO_2 concentrations in 2013, except monitoring sites SH3, SH4, SH6, SH13 and SH18 which reported peak annual mean NO_2 concentrations in 2016. An increase in the NO_2 annual mean concentrations, when compared to 2015 data, was observed in 2016 at all the monitoring sites with a maximum annual mean concentration of 34.8µg/m^3 recorded at SH13-Pinchbeck Road.

Both automatic and non-automatic monitoring results are well below 60µg/m^3, which indicates that an exceedance of the 1-hour mean objective is unlikely at these sites.

3.2.2 Particulate Matter (PM_{10})

Table A.5 in Appendix A compares the ratified and adjusted monitored PM_{10} annual mean concentrations for the past 5 years with the air quality objective of 40µg/m^3.

Table A.6 in Appendix A compares the ratified continuous monitored PM_{10} daily mean concentrations for the past 5 years with the air quality objective of 50µg/m^3, not to be exceeded more than 35 times per year.

Figure A.2 show the trends of the annual mean PM_{10} concentrations recorded at both automatic monitoring sites during 2012 to 2016. At both automatic monitoring

sites, the annual mean PM_{10} concnentrations have been well below the annual mean PM_{10} AQS objective in last five years. The peak PM_{10} annual mean concentrations were recorded in 2013. Since then, the PM_{10} annual mean concentrations have decreased for the last three years.

Figure A.3 show the trends of the number of exceedances of PM_{10} 24-hour mean AQS objective recorded at both automatic monitoring sites during 2012 to 2016. At both sites, the number of exceedances of the daily mean objective is considerably lower than the permitted 35.

3.2.3 Other Pollutants

In addition to monitoring NO_2 and PM_{10}, the automatic analyser located at Westmere School also monitors Ozone (O_3) concentrations. There is no requirement to report these data for LAQM purposes; however, the results are discussed herein for completeness.

O_3 is a trans-boundary pollutant; its sources can be frequently spatially distant from the measured site of the concentration. This pollutant is not prescribed an air quality objective for the purposes of LAQM and therefore the results presented are for information only.

The AQS objective for ground level O_3 (to be met by 2005) states that the maximum daily concentration (measured as an 8-hour running mean) of 100 µg/m^3 should not be exceeded more than 10 times per year.

Table A.7 in Appendix A summarises the number of exceedances over the last 4 years. The number of exceedances of maximum daily concentration (measured as an 8-hour running mean) of 100 µg/m^3 is lower than permitted 10.

Appendix A: Monitoring Results

Table A.1 – Details of Automatic Monitoring Sites

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Monitoring Technique	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Inlet Height (m)
CM1	Spalding Monkhouse School	Roadside	523168	322454	NO_2, PM_{10}	N	Chemiluminescence, TEOM/BAM	1	25	3
CM2	Westmere School	Urban Background	547264	321709	NO_2, O_3, PM_{10}	N	Chemiluminescence, UV Absorption,TEOM	14	190	3

Notes:

(1) 0m if the monitoring site is at a location of exposure (e.g. installed on the façade of a residential property).

(2) N/A if not applicable.

Table A.2 – Details of Non-Automatic Monitoring Sites

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Tube collocated with a Continuous Analyser?	Height (m)
SH 1	21 Millfield Gardens	UB	524388	310520	NO_2	N	6.8	2.9	N	2.2
SH 2	Nutten Stoven	UB	535595	325453	NO_2	N	5.6	21.8	N	2.2
SH 3	Priory Road	UB	524734	322403	NO_2	N	38.4	80	N	2.2
SH 4	46 The Hollies	UB	536523	325078	NO_2	N	8.4	0.2	N	2.2
SH 5	Station Road	R	526585	328726	NO_2	N	24.9	1.5	N	2.2
SH 6	103 Boston Road	R	535525	325589	NO_2	N	25.7	9.5	N	2.2
SH 7	Field End	R	541013	324393	NO_2	N	5.9	<2	N	2.2
SH8/9/10	Westmere (Triplicate)	UB	547264	321709	NO_2	N	69.4	61.2	Y	3
SH 11	Metalair Site	R	547957	321013	NO_2	N	N/A	<2	N	2.2
SH 13	Pinchbeck Road	K	524595	323793	NO_2	N	20.7	0.7	N	2.2
SH 14	Springfields Roundabout	K	526309	323820	NO_2	N	54.2	0.5	N	2.2
SH 15	Church Street, Pinchbeck	R	524182	325804	NO_2	N	0	1.5	N	2.2
SH 16	Bicker Road, Donington	R	520917	336064	NO_2	N	7.5	16.5	N	2.2
SH 17	High Road, Spalding	R	524892	322571	NO_2	N	0	1.5	N	2.2
SH 18	Hawthorn Bank, Spalding	R	524191	321328	NO_2	N	1.5	3	N	2.2

Notes:

(1) 0m if the monitoring site is at a location of exposure (e.g. installed on/adjacent to the façade of a residential property).

(2) N/A if not applicable.
K – Kerbside, R – Roadside, UB – Urban Background

Table A.3 – Annual Mean NO_2 Monitoring Results

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) [1]	Valid Data Capture 2016 (%) [2]	NO_2 Annual Mean Concentration ($\mu g/m^3$) [3]				
					2012	2013	2014	2015	2016
CM1	Roadside	Automatic	99.8	100	15.3	11.3	10.4	10.5	12.7
CM2	Urban Background	Automatic	99.1	99.1	13.9	12.7	12.1	9	11.3
SH 1	Urban Background	Diffusion Tube	100.0	100.0	13.8	14.9	13.13	10.5	12.9
SH 2	Urban Background	Diffusion Tube	91.7	91.7	13.9	15	12.19	10.5	12.0
SH 3	Urban Background	Diffusion Tube	91.7	91.7	17.6	19.4	18.86	16.5	19.4
SH 4	Urban Background	Diffusion Tube	91.7	91.7	13.9	13.9	12.22	10.7	14.0
SH 5	Roadside	Diffusion Tube	83.3	83.3	17.4	17.9	16.2	14.6	16.2
SH 6	Near-Road	Diffusion Tube	91.7	91.7	22.5	25.4	22.8	19.7	25.9
SH 7	Roadside	Diffusion Tube	100	100	19.4	21	19.1	17.8	20.3
SH8/9/10	Urban Background	Diffusion Tube	100	100	12.6	13.5	12.1	10.1	11.0
SH 11	Roadside	Diffusion Tube	91.7	91.7	21.5	21.9	20.8	17.7	19.5
SH 13	Kerbside	Diffusion Tube	100	100	26.9	32.3	30.1	29.8	34.8
SH 14	Kerbside	Diffusion Tube	100	100	24.1	27.3	25.4	21.3	24.9
SH 15	Roadside	Diffusion Tube	91.7	91.7	27.2	31.6	28.3	23.6	28.6
SH 16	Near-Road	Diffusion Tube	100	100	14.7	16.1	14.3	12.5	13.9

SH 17	Roadside	Diffusion Tube	100	100	25	28.3	28.2	24.3	27.5
SH 18	Roadside	Diffusion Tube	100	100	25.4	25.4	24.1	22.5	26.5

☒ **Diffusion tube data has been bias corrected**

☐ **Annualisation has been conducted where data capture is <75%**

☐ **If applicable, all data has been distance corrected for relevant exposure**

Notes:

Exceedances of the NO_2 annual mean objective of 40µg/m^3 are shown in **bold**.

NO_2 annual means exceeding 60µg/m^3, indicating a potential exceedance of the NO_2 1-hour mean objective are shown in **bold and underlined.**

(1) Data capture for the monitoring period, in cases where monitoring was only carried out for part of the year.

(2) Data capture for the full calendar year (e.g. if monitoring was carried out for 6 months, the maximum data capture for the full calendar year is 50%).

(3) Means for diffusion tubes have been corrected for bias. All means have been "annualised" as per Boxes 7.9 and 7.10 in LAQM.TG16 if valid data capture for the full calendar year is less than 75%. See Appendix C for details.

Figure A.1 – Trends in Annual Mean NO_2 Concentrations

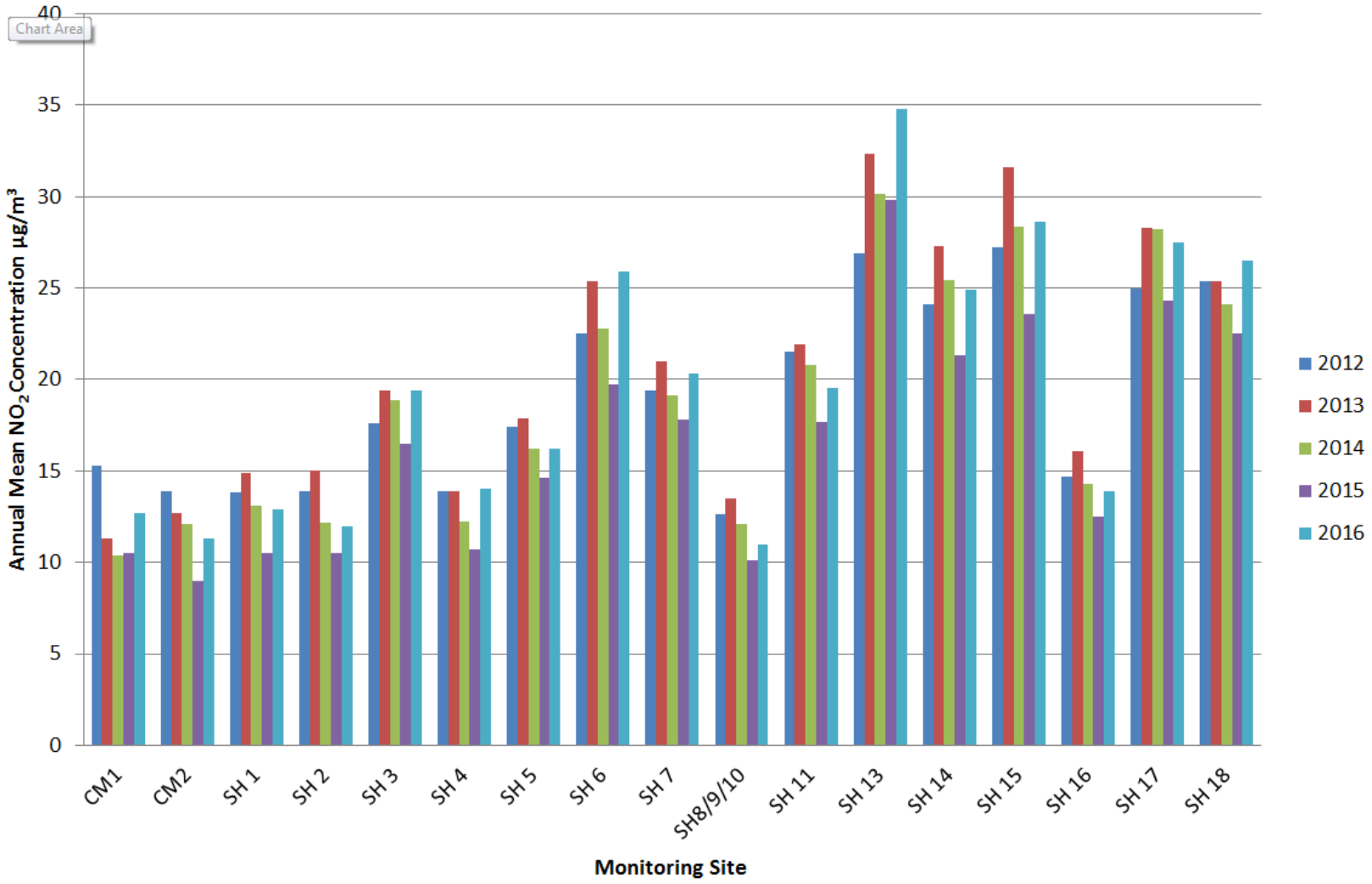


Table A.4 – 1-Hour Mean NO_2 Monitoring Results

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2016 (%) (2)	NO_2 1-Hour Means > 200µg/m^3 (3)				
					2012	2013	2014	2015	2016
CM1	Roadside	Automatic	99.8	99.8	0 (84)	0 (55)	0	0	0
CM2	Urban Background	Automatic	99.1	99.1	0 (67)	0	0	0	0

Notes:

Exceedances of the NO_2 1-hour mean objective (200µg/m^3 not to be exceeded more than 18 times/year) are shown in **bold.**

(1) Data capture for the monitoring period, in cases where monitoring was only carried out for part of the year.

(2) Data capture for the full calendar year (e.g. if monitoring was carried out for 6 months, the maximum data capture for the full calendar year is 50%).

(3) If the period of valid data is less than 85%, the 99.8th percentile of 1-hour means is provided in brackets.

Table A.5 – Annual Mean PM_{10} Monitoring Results

Site ID	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2016 (%) (2)	PM_{10} Annual Mean Concentration ($\mu g/m^3$) (3)				
				2012	2013	2014	2015	2016
CM1	Roadside	96.5	96.5	17.3	18.9	17.9	15.4	13.5
CM2	Urban Background	97.5	97.5	16	17.9	17.2	14.8	14

☐ **Annualisation has been conducted where data capture is <75%**

Notes:

Exceedances of the PM_{10} annual mean objective of 40$\mu g/m^3$ are shown in **bold.**

(1) Data capture for the monitoring period, in cases where monitoring was only carried out for part of the year.

(2) Data capture for the full calendar year (e.g. if monitoring was carried out for 6 months, the maximum data capture for the full calendar year is 50%).

(3) All means have been "annualised" as per Boxes 7.9 and 7.10 in LAQM.TG16, valid data capture for the full calendar year is less than 75%. See Appendix C for details.

Figure A.2 – Trends in Annual Mean PM_{10} Concentrations

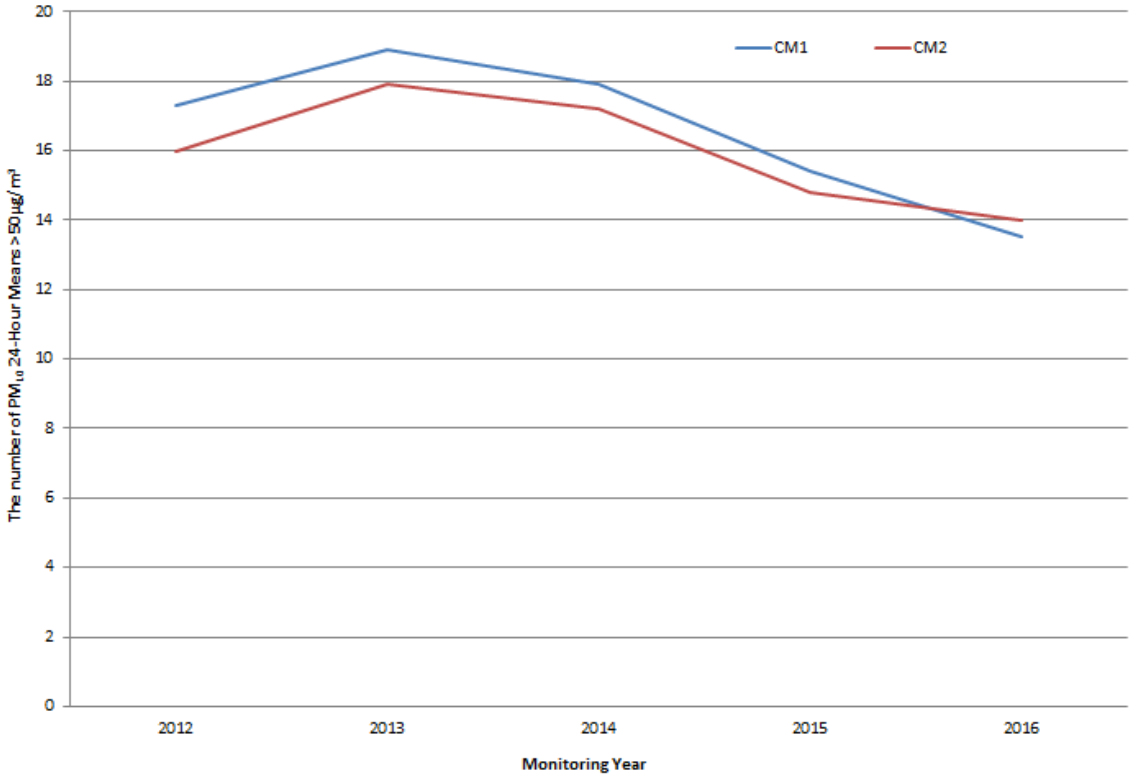


Table A.6 – 24-Hour Mean PM_{10} Monitoring Results

Site ID	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2016 (%) (2)	PM_{10} 24-Hour Means > 50µg/m^3 (3)				
				2012	2013	2014	2015	2016
CM1	Roadside	96.8	96.8	2	5	4	1	2
CM2	Urban Background	96.8	96.8	2	4 (27.6)	4	1	1

Notes:

Exceedances of the PM_{10} 24-hour mean objective (50µg/m^3 not to be exceeded more than 35 times/year) are shown in **bold.**

(1) Data capture for the monitoring period, in cases where monitoring was only carried out for part of the year.

(2) Data capture for the full calendar year (e.g. if monitoring was carried out for 6 months, the maximum data capture for the full calendar year is 50%).

(3) If the period of valid data is less than 85%, the 90.4th percentile of 24-hour means is provided in brackets.

Figure A.3 – Trends in Number of 24-Hour Mean PM_{10} Results >50µg/m^3

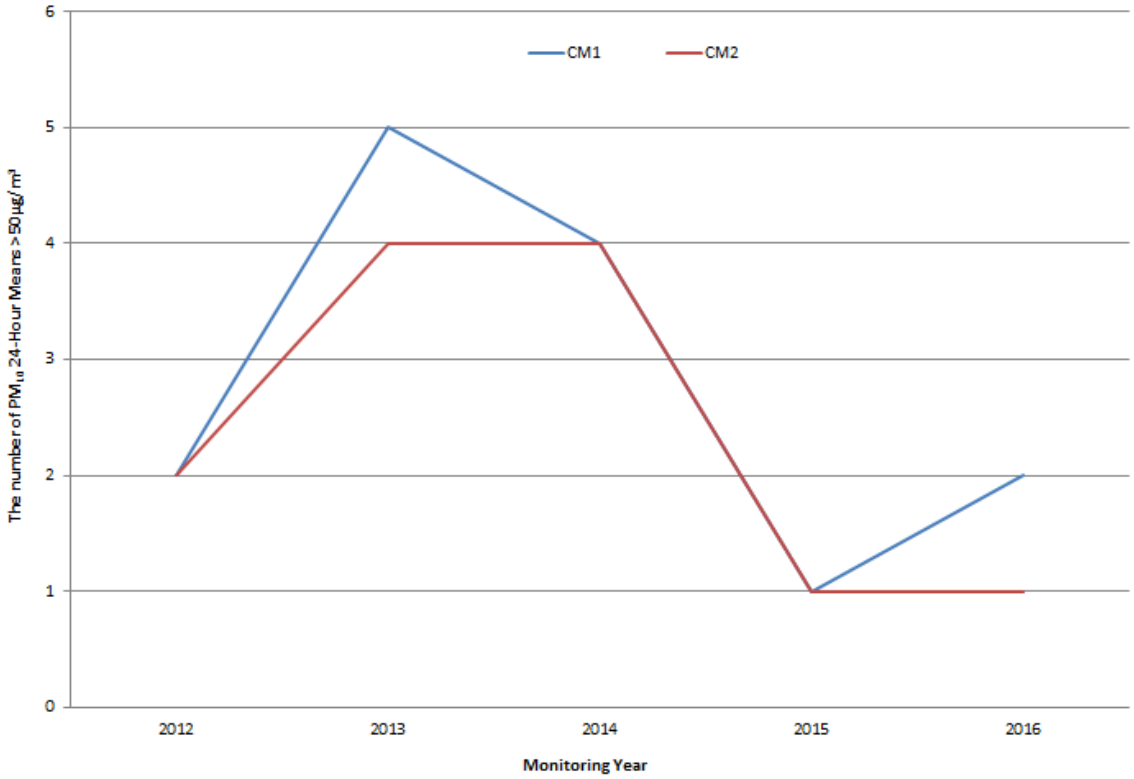


Table A.7 – Results of Westmere School Automatic Ozone Monitoring

Site ID	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2015 (%) (2)	Number of Exceedances of Maximum Daily Concentration (8-hour running mean)			
				2013	2014	2015	2016
CM2	Roadside	99.9	99.9	55	8	10	3

Notes:

Exceedance of the O_3 objective: 8-hour mean of 100 µg/m^3, 10 exceedances allowed per year.

(1) data capture for the monitoring period, in cases where monitoring was only carried out for part of the year.

(2) data capture for the full calendar year (e.g. if monitoring was carried out for 6 months, the maximum data capture for the full calendar year is 50%).

Appendix B: Full Monthly Diffusion Tube Results for 2016

Table B. 1 – NO_2 Monthly Diffusion Tube Results - 2016

Site ID	NO_2 Mean Concentrations ($\mu g/m^3$)														
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean		
													Raw Data	Bias Adjusted (1.19) and Annualised (1)	Distance Corrected to Nearest Exposure (2)
SH 1	17.1	15.4	8.4	7.5	8.6	6.0	6.0	2.8	10.5	9.5	13.9	24.2	10.8	12.9	-
SH 2	15.3	12.6	9.2	9.2	8.6	8.7	6.3	4.2	9.7	11.1	16.1	-	10.1	12.0	-
SH 3	22.7	19.3	15.9	15.4	17.2	12.5	12.8	9.3	15.1	16.8	22.5	-	16.3	19.4	-
SH 4	17.8	14.4	9.9	10.0	8.5	6.0	-	6.5	9.5	8.9	16.5	21.2	11.8	14.0	-
SH 5	-	15.8	12.7	12.1	11.7	11.3	12.8	9.3	18.0	12.9	19.6	-	13.6	16.2	-
SH 6	22.9	22.3	23.2	24.4	19.6	-	13.4	14.7	18.8	27.4	23.8	28.4	21.7	25.9	-
SH 7	26.6	18.8	13.9	14.7	14.4	10.5	16.9	13.5	18.2	11.5	19.7	26.0	17.1	20.3	-
SH8/9/10	16.9	11.6	7.0	7.9	6.6	4.0	5.5	4.8	8.1	5.6	12.9	20.1	9.3	11.0	-
SH 11	21.3	18.2	16.1	16.3	18.6	14.6	12.9	6.8	17.5	16.4	21.3	-	16.4	19.5	-
SH 13	35.1	30.0	21.8	26.9	22.9	23.1	28.9	24.2	29.5	25.8	37.8	-	29.3	34.8	-
SH 14	21.6	25.7	20.1	21.2	19.9	16.7	18.8	16.9	21.1	22.2	27.7	19.4	21.0	24.9	-
SH 15	28.2	28.7	22.8	19.4	21.3	21.9	18.5	19.6	25.8	27.2	31.3	-	24.1	28.6	-
SH 16	20.6	14.0	9.7	8.8	9.9	8.0	8.1	7.5	11.7	10.5	17.5	14.2	11.7	13.9	-
SH 17	33.1	22.4	17.3	18.4	21.0	18.1	19.5	14.6	24.5	20.8	30.0	37.5	23.1	27.5	-
SH 18	29.5	25.1	22.0	21.2	19.3	15.9	21.2	17.3	21.1	18.9	27.7	28.2	22.3	26.5	-

☒ **Local bias adjustment factor used**

☐ **National bias adjustment factor used**

☐ **Annualisation has been conducted where data capture is <75%**

Notes:

Exceedances of the NO_2 annual mean objective of 40µg/m^3 are shown in **bold**.

NO_2 annual means exceeding 60µg/m^3, indicating a potential exceedance of the NO_2 1-hour mean objective are shown in **bold and underlined.**

(1) See Appendix C for details on bias adjustment and annualisation.

(2) Distance corrected to nearest relevant public exposure.

Appendix C: Supporting Technical Information / Air Quality Monitoring Data QA/QC

QA/QC of Automatic Monitoring

South Holland District Council contracts data management for their continuous analysers to Ricardo-AEA. The Quality Assurance/Quality Control (AQ/QC) procedures employed by Ricardo-AEA are equivalent to the UK Automatic Urban and Rural Network (AURN) procedures. The PM_{10} results have been corrected by Ricardo-EE who undertake the data management for the two automatic continuous monitoring sites. TEOM data were VCM corrected and unheated BAM data have been corrected by multiplying by 0.833.

All monitoring locations recorded data capture of >75%, therefore it was not required to annualise any monitoring data.

Diffusion Tube Monitoring Data

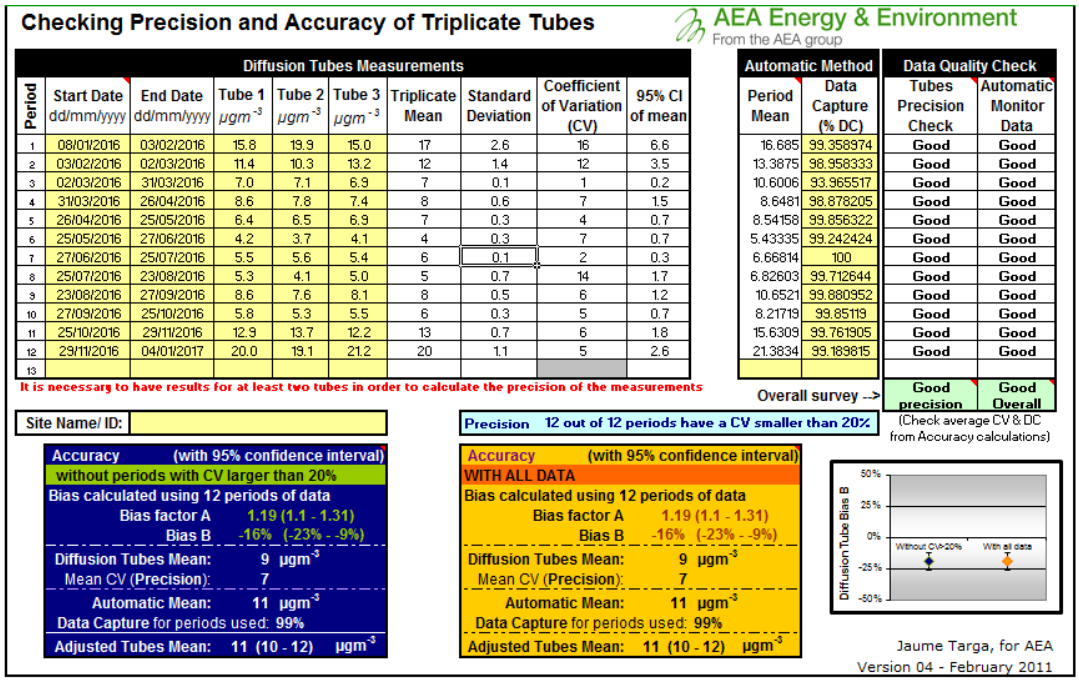
The diffusion tube data has been corrected using a bias adjustment factor, which is an estimate of the difference between diffusion tube concentration and continuous monitoring, the latter assumed to be a more accurate method of monitoring. Triplicate co-location studies can be used to determine a local bias factor based on the comparison of diffusion tube results with data taken 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. With regard to the application of a bias adjustment factor for diffusion tubes, the Defra Technical Guidance LAQM.TG(16) and the LAQM Helpdesk recommend the use of a local bias adjustment factor where available and relevant to diffusion tube sites.

The national bias adjustment factor is 1.01 (based on 18 studies) as derived from the national bias adjustment calculator (Spreadsheet Version Number: 06/2017).

There is a co-located triplicate diffusion tube monitoring site (SH 8/9/10) installed at the urban background Westmere School automatic monitoring site. The local bias correction factor is calculated to be 1.19 using the Diffusion Tube Bias Adjustment Factor Spreadsheet (AEA_DifTPAB_v04.xlsx (Figure C.1)). This is slightly higher than the nationally derived factor of 1.01. It was decided to use a local bias

adjustment factor (1.19) for the year 2016, as both data capture and tubes precision are good. In additon, a locally derived factor of 0.86 was used for 2015 data.

Figure C.1 – Local Diffusion Tube Correction Factor Calculation



Checking Precision and Accuracy of Triplicate Tubes

AEA Energy & Environment
From the AEA group

Diffusion Tubes Measurements

Period	Start Date dd/mm/yyyy	End Date dd/mm/yyyy	Tube 1 µgm^{-3}	Tube 2 µgm^{-3}	Tube 3 µgm^{-3}	Triplicate Mean	Standard Deviation	Coefficient of Variation (CV)	95% CI of mean
1	08/01/2016	03/02/2016	15.8	19.9	15.0	17	2.6	16	6.6
2	03/02/2016	02/03/2016	11.4	10.3	13.2	12	1.4	12	3.5
3	02/03/2016	31/03/2016	7.0	7.1	6.9	7	0.1	1	0.2
4	31/03/2016	26/04/2016	8.6	7.8	7.4	8	0.6	7	1.5
5	26/04/2016	25/05/2016	6.4	6.5	6.9	7	0.3	4	0.7
6	25/05/2016	27/06/2016	4.2	3.7	4.1	4	0.3	7	0.7
7	27/06/2016	25/07/2016	5.5	5.6	5.4	6	0.1	2	0.3
8	25/07/2016	23/08/2016	5.3	4.1	5.0	5	0.7	14	1.7
9	23/08/2016	27/09/2016	8.6	7.6	8.1	8	0.5	6	1.2
10	27/09/2016	25/10/2016	5.8	5.3	5.5	6	0.3	5	0.7
11	25/10/2016	29/11/2016	12.9	13.7	12.2	13	0.7	6	1.8
12	29/11/2016	04/01/2017	20.0	19.1	21.2	20	1.1	5	2.6
13									

It is necessary to have results for at least two tubes in order to calculate the precision of the measurements

Automatic Method		Data Quality Check	
Period Mean	Data Capture (% DC)	Tubes Precision Check	Automatic Monitor Data
16.685	99.358974	Good	Good
13.3875	98.958333	Good	Good
10.6006	93.965517	Good	Good
8.6481	98.878205	Good	Good
8.54158	99.856322	Good	Good
5.43335	99.242424	Good	Good
6.66814	100	Good	Good
6.82603	99.712644	Good	Good
10.6521	99.880952	Good	Good
8.21719	99.85119	Good	Good
15.6309	99.761905	Good	Good
21.3834	99.189815	Good	Good
Overall survey -->		Good precision	Good Overall

(Check average CV & DC from Accuracy calculations)

Site Name/ ID:

Precision 12 out of 12 periods have a CV smaller than 20%

Accuracy (with 95% confidence interval) without periods with CV larger than 20%
Bias calculated using 12 periods of data
Bias factor A 1.19 (1.1 - 1.31)
Bias B -16% (-23% - -9%)
Diffusion Tubes Mean: 9 µgm^{-3}
Mean CV (Precision): 7
Automatic Mean: 11 µgm^{-3}
Data Capture for periods used: 99%
Adjusted Tubes Mean: 11 (10 - 12) µgm^{-3}

Accuracy (with 95% confidence interval) WITH ALL DATA
Bias calculated using 12 periods of data
Bias factor A 1.19 (1.1 - 1.31)
Bias B -16% (-23% - -9%)
Diffusion Tubes Mean: 9 µgm^{-3}
Mean CV (Precision): 7
Automatic Mean: 11 µgm^{-3}
Data Capture for periods used: 99%
Adjusted Tubes Mean: 11 (10 - 12) µgm^{-3}

Jaume Targa, for AEA
Version 04 - February 2011

QA/QC of Diffusion Tube Monitoring

The diffusion tubes are supplied and analysed by Gradko International Limited utilising the 50% Triethanolamine (TEA) in acetone preparation method.

Gradko International Ltd is a UKAS accredited laboratory and participates in laboratory performance and proficiency testing schemes. These provide strict performance criteria for participating laboratories to meet, thereby ensuring NO_2 concentrations reported are of a high calibre. The laboratory follows the procedures set out in the Harmonisation Practical Guidance and participates in the AIR proficiency-testing (AIR-PT) scheme. Defra and the Devolved Administrations advise that diffusion tubes used for LAQM should be obtained from laboratories that have demonstrated satisfactory performance in the AIR-PT scheme. Laboratory performance in the AIR-PT is also assessed by the National Physical Laboratory (NPL), alongside laboratory data from the monthly NPL Field Inter-Comparison Exercise.

In the 2016 AIR-PT results, AIR-PT AR012 (January to February 2016), AIR-PT AR013 (April to May 2016), AR015 (July to August 2016) and AR016 (September to

October 2016), Gradko scored 100%. The percentage score reflects the results deemed to be satisfactory based upon the z-score of < ±2.

ADMS Screen for Biomass Boiler in South Holland District

In 2016, South Holland District Council sent out a questionnaire to all operators in the district requesting information for screening the impact of the installed biomass boilers on NO_2 and PM_{10} concentrations. The Council collected the emission data for 10 biomass boilers within the district. Due to stack height restrictions, 8 of the biomass boilers could not be screened out using the biomass emission screening tool. Therefore, these were assessed using ADMS-Screen screening assessment software. The biomass boilers at Millview Nurseries and Lamb Flowers Ltd. were assessed with the biomass emission screening tool. However, Lamb Flowers Ltd. failed the screen and therefore was further assessed with the ADMS-Screen software.

Table C.1 provides the input parameters and output of target emission rates for biomass boilers using the biomass emission screening tool at Millview Nurseries. The actual emission rates for NO_X and PM_{10} are well below the target emission rates.

Table C.1 – Biomass Emission Screening Input and Output at Millview Nurseries

Parameter	Millview Nurseries
Site Location	Fengate Rd, Spalding PE11 3NE, UK
Biomass unit(s)	1 x Uniconfort Atom 199kW
Thermal output (kWth)	199
Single stack internal diameter at exit point (m)	0.2
Stack release height (m)	6.4
Location (OS co-ordinates) of the emissions stack	521062, 324356
Actual Emission Rate NOx (g/s)	0.009
Actual Emission Rate PM (g/s)	0.003
Number of Stacks	1
2016 NO_2 annual mean Background (µg/m^3)	9.8
2016 PM_{10} annual mean Background (µg/m^3)	17.4
Target Emission Rate NOx (g/s)	0.1
Target Emission Rate PM (g/s)	0.02

The input parameters for the ADMS screening assessment summarised in Table C.2-Table C.4. Background pollutant concentrations for 2016 were obtained from Defra's 2013-reference year background maps for the 1km grid square within which the biomass boiler is located.

Table C.2 – Input Parameters for ADMS-Screen Screening Assessment

Parameter	Holbeach Farm	Pinchbeck Farm	Cowbit Farm
Site Location	New River Gate, Spalding, PE12 0RY	Coward's Ln, Spalding, PE11 3SP	61 Mill Drove N, Cowbit, Spalding, PE12 6AS
Biomass unit(s)	8 x Herz Firematic 151kW	10 x Herz Firematic 151kW	9 x Herz Firematic 151kW
Thermal output (kWth)	151	151	151
Single stack internal diameter at exit point (m)	0.25	0.25	0.25
Stack release height (m)	4	4	4
Temperature of release (^{o}C)	95	95	95
Location (OS co-ordinates) of the emissions stack	534524, 317078	521779, 327176	526802,318671
Co-ordinates of centre of building within 5 stack heights (m)	534524, 317078	521779, 327176	526802,318671
Height, length and Width of any building within 5 stack heights (m)	4x235x88	3x292x 91	4X297.5X81
Angle of length of building from North (°)	75	6	93
NOx (mg/m^3)	156	156	156
PM (mg/m^3)	10	10	10
NOx (g/s)	0.014	0.014	0.014
PM (g/s)	0.0009	0.0009	0.0009
Number of Stacks	8	10	9
NOx (g/s) X Stacks	0.11	0.14	0.12
PM (g/s) X Stacks	0.007	0.09	0.008
Internal diameter of X stacks at exit point (m)	0.7	0.8	0.75
Efflux velocity (m/s)	0.09	0.09	0.09

2016 NO_2 annual mean Background ($\mu g/m^3$)	9.5	9.7	10.5
2016 PM_{10} annual mean Background ($\mu g/m^3$)	17.1	17.2	17.4
2016 NO_2 short-term Background ($\mu g/m^3$)	18.9	19.4	21.0
2016 PM_{10} short-term Background ($\mu g/m^3$)	34.2	34.4	34.8

Table C.3 – Input Parameters for ADMS-Screen Screening Assessment

Parameter	Gosberton Farm	South Drove Farm	Lambs Flowers Ltd
Site Location	6 Broad Drove, Gosberton Clough, Spalding PE11 4JS	S Drove, Spalding PE11 3ED	1 Herdgate Ln, Pinchbeck, Spalding PE11 3UP, UK
Biomass unit(s)	4 x Uniconforton Atom 199kW	4 x Uniconfort Atom 199kW	1xGlobal 90 990kW
Thermal output (kWth)	199	191	990
Single stack internal diameter at exit point (m)	0.25	0.25	0.45
Stack release height (m)	2	2	9.5
Temperature of release (oC)	95	95	95
Location (OS co-ordinates) of the emissions stack	518245, 330060	523700,318255	525512,327013
Co-ordinates of centre of building within 5 stack heights (m)	518245, 330060	523700,318255	525524,327116
Height, length and Width of any building within 5 stack heights (m)	3x111x92	4x106x88	4x134x92
Angle of length of building from North (°)	35	75	170
NOx (mg/m^3)	156	156	-
PM (mg/m^3)	10	10	-
NOx (g/s)	0.018	0.018	0.28
PM (g/s)	0.001	0.001	0.28
Number of Stacks	4	4	1
NOx (g/s) X Stacks	0.07	0.07	0.28
PM (g/s) X Stacks	0.004	0.004	0.28
Internal diameter of X stacks at exit point (m)	0.5	0.5	0.45

Efflux velocity (m/s)	0.12	0.12	0.57
2016 NO_2 annual mean Background (µg/m^3)	9.7	10.3	11.2
2016 PM_{10} annual mean Background (µg/m^3)	17.1	20.6	18.2
2016 NO_2 short-term Background (µg/m^3)	19.4	17.6	22.4
2016 PM_{10} short-term Background (µg/m^3)	34.2	35.2	36.4

Table C.4 – Input Parameters for ADMS-Screen Screening Assessment

Parameter	Luttongate Farm	Sutton St Edmunds Farm	Eastfields Farm
Site Location	Lutton Gate Rd, Spalding PE12 0NX	200 Lutton Gate Rd, Sutton St Edmund, Spalding PE12 0LJ	96 Lutton Gate Rd, Spalding, PE12 0PA
Biomass unit(s)	10 x Herz Firematic 151kW	8 x Herz Firematic 151kW	8 x Herz Firematic 151kW
Thermal output (kWth)	151	151	151
Single stack internal diameter at exit point (m)	0.25	0.25	0.25
Stack release height (m)	4	4	4
Temperature of release (oC)	95	95	95
Location (OS co-ordinates) of the emissions stack	536301,315687	535789, 313235	535052, 312329
Co-ordinates of centre of building within 5 stack heights (m)	536301,315687	535789, 313235	535007,312336
Height, length and width of any building within 5 stack heights (m)	6X197X134	5X188X111	5x190x84
Angle of length of building from North (°)	22	114	107
NOx (mg/m^3)	156	156	156
PM (mg/m^3)	10	10	10
NOx (g/s)	0.014	0.014	0.014
PM (g/s)	0.0009	0.0009	0.0009
Number of Stacks	10	8	8
NOx (g/s) X stacks	0.14	0.11	0.11
PM (g/s) X stacks	0.009	0.007	0.007
Internal diameter of X stacks at exit point (m)	0.8	0.7	0.7
Efflux velocity (m/s)	0.09	0.09	0.09

2016 NO_2 annual mean Background (µg/m^3)	9.4	9.5	9.5
2016 PM_{10} annual mean Background (µg/m^3)	17.1	17.1	16.9
2016 NO_2 short-term Background (µg/m^3)	18.8	18.9	18.9
2016 PM_{10} short-term Background (µg/m^3)	34.2	34.2	33.8

The AQMAU guidance advises that the source term should be modelled as NOx (as NO_2) and then suggests a tiered approach when considering ambient NO_2:NOx ratios:

- **Screening Scenario:** 50% and 100% of the modelled NOx process contributions should be used for short-term and long-term average concentration, respectively. That is, 50% of the predicted NOx concentrations should be assumed to be NO_2 for short-term assessments and 100 % of the predicted NOx concentrations should be assumed to be NO_2 for long-term assessments;
- **Worst Case Scenario:** 35% and 70% of the modelled NOx process contributions should be used for short-term and long-term average concentration, respectively. That is, 35% of the predicted NOx concentrations should be assumed to be NO_2 for short-term assessments and 70% of the predicted NOx concentrations should be assumed to be NO_2 for long-term assessments; and
- **Case Specific Scenario:** Operators are asked to justify their use of percentages lower than 35% for short-term and 70% for long-term assessments in their application reports.

In line with the AQMAU guidance, the screening assessments have therefore used a NO_x to NO_2 ratio of 100% for long term average concentrations, 50% for short term concentrations.

Table C.5 to Table C.22 details the predicted maximum Process Contribution (PC) and Predicted Environmental Concentrations (PEC) of long-term and short-term NO_2 and PM_{10} emissions from biomass boilers at the maximum location and existing human receptors.

Table C.5 and Table C.6 provides the ADMS-Screen Screening Assessment results at Holbeach Farm for NO_2 and PM_{10}. The results indicate that maximum long-term and short-term PECs of NO_2 and PM_{10} are well below the respective AQS (air quality standard) objectives at all assessed locations. Therefore, NO_2 and PM_{10} emissions from the biomass boilers at Holbeach Farm are not expected to be significant at existing human receptors.

Table C.5 – NO_2 Results of ADMS-Screen Screening Assessment at Holbeach Farm

Receptor	The Annual Mean NO_2				The 99.8th Percentile of 1-hour Mean NO_2			
	AQS µg/m^3	PC µg/m^3	PEC µg/m^3	% PEC OF AQS	AQS µg/m^3	PC µg/m^3	PEC µg/m^3	% PEC OF AQS
Location with Maximum Values	40	8.7	18.2	45.4	200	62.95	81.9	40.9
Receptor (534375,317004)	40	2.6	12.1	30.2	200	27.9	46.8	23.4

Table C.6– PM_{10} Results of ADMS-Screen Screening Assessment at Holbeach Farm

Receptor	The Annual Mean PM_{10}				The 90.4th Percentile of 1-hour Mean PM_{10}			
	AQS µg/m^3	PC µg/m^3	PEC µg/m^3	% PEC OF AQS	AQS µg/m^3	PC µg/m^3	PEC µg/m^3	% PEC OF AQS
Location with Maximum Values	40	0.6	17.6	44.1	50	1.2	35.4	70.7
Receptor (534375,317004)	40	0.2	17.3	43.2	50	0.4	34.6	69.1

Table C.7 and Table C.8 provides the ADMS-Screen Screening Assessment results at Pinchbeck Farm for NO_2 and PM_{10}. The results indicate that the maximum long-term and short-term PECs of NO_2 and PM_{10} are well below the respective AQS (air quality standard) objectives at all assessed locations. Therefore, NO_2 and PM_{10} emissions from the biomass boilers at Pinchbeck Farm are not expected to be significant at existing human receptors.

Table C.7 – NO_2 Results of ADMS-Screen Screening Assessment at Pinchbeck Farm

Receptor	The Annual Mean NO_2				The 99.8th Percentile of 1-hour Mean NO_2			
	AQS µg/m^3	PC µg/m^3	PEC µg/m^3	% PEC OF AQS	AQS µg/m^3	PC µg/m^3	PEC µg/m^3	% PEC OF AQS
Location with Maximum Values	40	8.2	17.9	44.8	200	84.55	104.0	52.0
Receptor (521731,326983)	40	1.4	11.1	27.8	200	21.2	40.6	20.3

Table C.8– PM_{10} Results of ADMS-Screen Screening Assessment at Pinchbeck Farm

Receptor	The Annual Mean PM_{10}				The 90.4th Percentile of 1-hour Mean PM_{10}			
	AQS µg/m^3	PC µg/m^3	PEC µg/m^3	% PEC OF AQS	AQS µg/m^3	PC µg/m^3	PEC µg/m^3	% PEC OF AQS
Location with Maximum Values	40	0.5	17.7	44.3	50	1.3	35.7	71.4
Receptor (521731,326983)	40	0.09	17.3	43.2	50	0.1	34.5	69.0

Table C.9 and Table C.10 provide the ADMS-Screen Screening Assessment results at Cowbit Farm for NO_2 and PM_{10}. The results indicate that the maximum long-term and short-term PECs of NO_2 and PM_{10} are well below the respective AQS (air quality standard) objectives at all assessed locations. Therefore, NO_2 and PM_{10} emissions from the biomass boilers at Cowbit Farm are not expected to be significant at existing human receptors.

Table C.9 – NO_2 Results of ADMS-Screen Screening Assessment at Cowbit Farm

Receptor	The Annual Mean NO_2				The 99.8th Percentile of 1-hour Mean NO_2			
	AQS µg/m^3	PC µg/m^3	PEC µg/m^3	% PEC OF AQS	AQS µg/m^3	PC µg/m^3	PEC µg/m^3	% PEC OF AQS
Location with Maximum Values	40	10.9	21.4	53.5	200	80.8	101.8	50.9
Receptor (526624,318673)	40	1.3	11.8	29.5	200	24.4	45.4	22.7

Table C.10 – PM_{10} Results of ADMS-Screen Screening Assessment at Cowbit Farm

Receptor	The Annual Mean PM_{10}				The 90.4th Percentile of 1-hour Mean PM_{10}			
	AQS µg/m^3	PC µg/m^3	PEC µg/m^3	% PEC OF AQS	AQS µg/m^3	PC µg/m^3	PEC µg/m^3	% PEC OF AQS
Location with Maximum Values	40	0.70	18.1	45.3	50	1.73	36.5	73.1
Receptor (526624,318673)	40	0.08	17.48	43.7	50	0.04	34.8	69.7

Table C.11 and Table C.12 provide the ADMS-Screen Screening Assessment results at Gosberton Farm for NO_2 and PM_{10}. The results for NO_2 indicate that the maximum annual mean PEC is below the annual mean NO_2 AQS objective, whilst the maximum predicted 99.8 percentile of 1-hour mean, at the location (518295, 330035) is above the 1-hour NO_2 AQS objective. However, the maximum annual mean and 99.8th Percentile of 1-hour mean PECs predicted at the closest sensitive receptor (518323, 30113) are below the long-term and short-term NO_2 AQS objectives. Therefore, NO_2 and PM_{10} emissions from the biomass boilers at Gosberton Farm are not expected to be significant at existing human receptors.

Table C.11 – NO_2 Results of ADMS-Screen Screening Assessment at Gosberton Farm

Receptor	The Annual Mean NO_2				The 99.8th Percentile of 1-hour Mean NO_2			
	AQS µg/m^3	PC µg/m^3	PEC µg/m^3	% PEC OF AQS	AQS µg/m^3	PC µg/m^3	PEC µg/m^3	% PEC OF AQS
Location with Maximum Values	40	22.9	32.6	81.5	200	1154.6	1174.0	587.0
Receptor (518323,30113)	40	5.5	15.2	38.0	200	44.2	63.6	31.8

Table C.12 – PM_{10} Results of ADMS-Screen Screening Assessment at Gosberton Farm

Receptor	The Annual Mean PM_{10}				The 90.4th Percentile of 1-hour Mean PM_{10}			
	AQS µg/m^3	PC µg/m^3	PEC µg/m^3	% PEC OF AQS	AQS µg/m^3	PC µg/m^3	PEC µg/m^3	% PEC OF AQS
Location with Maximum Values	40	1.4	18.5	46.3	50	1.2	35.4	70.8
Receptor (518323, 30113)	40	0.34	17.4	43.6	50	0.8	35	70.0

Table C.13 and Table C.14 provide the ADMS-Screen Screening Assessment results at South Drove Farm for NO_2 and PM_{10}. The results for NO_2 indicate that the maximum predicted annual mean and 99.8 percentile of 1-hour mean PECs, at location 523760, 318285, are above the respective NO_2 AQS objectives. However, the maximum annual mean and 99.8th Percentile of 1-hour mean PECs predicted at the closest sensitive receptor (523666, 318108) are well below the long-term and short-term NO_2 AQS objectives. The results for PM_{10} indicate that the maximum annual mean and 90.4th percentile of 24-hour mean PECs at all locations assessed are well below the respective PM_{10} AQS objectives. Therefore, NO_2 and PM_{10} emissions from the biomass boilers at South Drove Farm are not expected to be significant at existing human receptors.

Table C.13 – NO_2 Results of ADMS-Screen Screening Assessment at South Drove Farm

Receptor	The Annual Mean NO_2				The 99.8th Percentile of 1-hour Mean NO_2			
	AQS µg/m^3	PC µg/m^3	PEC µg/m^3	% PEC OF AQS	AQS µg/m^3	PC µg/m^3	PEC µg/m^3	% PEC OF AQS
Location with Maximum Values	40	58.3	68.6	171.5	200	1003.35	1023.95	512.0
Receptor (523666,318108)	40	1.4	11.7	29.3	200	20.9	41.5	20.8

Table C.14 – PM_{10} Results of ADMS-Screen Screening Assessment at South Drove Farm

Receptor	The Annual Mean PM_{10}				The 90.4th Percentile of 1-hour Mean PM_{10}			
	AQS µg/m^3	PC µg/m^3	PEC µg/m^3	% PEC OF AQS	AQS µg/m^3	PC µg/m^3	PEC µg/m^3	% PEC OF AQS
Location with Maximum Values	40	3.6	21.2	53.0	50	2.0	37.2	74.4
Receptor (523666,318108)	40	0.08	17.7	44.2	50	0.08	35.3	70.6

Table C.15 and Table C.16 provide the ADMS-Screen Screening Assessment results at Lambs Flowers Ltd for NO_2 and PM_{10}. The results indicate that the maximum long-term and short-term PECs of NO_2 and PM_{10} are below the respective AQS (air quality standard) objectives at all locations assessed. Therefore, NO_2 and PM_{10} emissions from the biomass boilers at Lambs Flowers Ltd are not expected to be significant at existing human receptors.

Table C.15 – NO_2 Results of ADMS-Screen Screening Assessment at Lambs Flowers Ltd

Receptor	The Annual Mean NO_2				The 99.8th Percentile of 1-hour Mean NO_2			
	AQS µg/m^3	PC µg/m^3	PEC µg/m^3	% PEC OF AQS	AQS µg/m^3	PC µg/m^3	PEC µg/m^3	% PEC OF AQS
Location with Maximum Values	40	5.7	16.9	42.1	200	117.9	140.3	70.2
Receptor (525587,327172)	40	2.8	14	35.0	200	16.9	39.3	19.7

Table C.16 – PM_{10} Results of ADMS-Screen Screening Assessment at Lambs Flowers Ltd

Receptor	The Annual Mean PM_{10}				The 90.4th Percentile of 1-hour Mean PM_{10}			
	AQS µg/m^3	PC µg/m^3	PEC µg/m^3	% PEC OF AQS	AQS µg/m^3	PC µg/m^3	PEC µg/m^3	% PEC OF AQS
Location with Maximum Values	40	5.7	23.9	59.6	50	9.2	45.6	91.2
Receptor (525587,327172)	40	2.8	21.0	52.5	50	8	44.4	88.8

Table C.17 and Table C.18 provide the ADMS-Screen Screening Assessment results at Luttongate Farm for NO_2 and PM_{10}. The results for NO_2 indicate that the maximum annual mean and 99.8 percentile of 1-hour mean PECs were predicted at location 536351,315777 and location 536371,315767 respectively. At both locations the respective NO_2 AQS objectives were exceeded. The maximum annual mean and 99.8th Percentile of 1-hour mean PECs for NO_2 predicted at the receptor (536370, 315792) are also above the long-term and short-term NO_2 AQS objectives. The results for PM_{10} indicate that the maximum annual mean and 90.4th percentile of 24-hour mean PECs at all locations assessed are well below the respective PM_{10} AQS objectives.

Therefore, NO_2 emissions from the biomass boilers at Luttongate Farm cannot be regarded as not significant at the closest sensitive receptor location. As a result, a detail assessment is required to determine the impact of emissions from the biomass boilers at Luttongate Farm.

Table C.17 – NO_2 Results of ADMS-Screen Screening Assessment at Luttongate Farm

Receptor	The Annual Mean NO_2				The 99.8 Percentile of 1-hour Mean NO_2			
	AQS µg/m^3	PC µg/m^3	PEC µg/m^3	% PEC OF AQS	AQS µg/m^3	PC µg/m^3	PEC µg/m^3	% PEC OF AQS
Location with Maximum Values	40	57.5	66.9	167.3	200	1164.5	1183.3	591.7
Receptor (536370,315792)	40	57.2	66.6	166.5	200	1164.5	1183.3	591.7

Table C.18 – PM_{10} Results of ADMS-Screen Screening Assessment at Luttongate Farm

Receptor	The Annual Mean PM_{10}				The 90 Percentile of 1-hour Mean PM_{10}			
	AQS µg/m^3	PC µg/m^3	PEC µg/m^3	% PEC OF AQS	AQS µg/m^3	PC µg/m^3	PEC µg/m^3	% PEC OF AQS
Location with Maximum Values	40	3.7	20.8	52.0	50	0.7	34.9	69.8
Receptor (536370,315792)	40	3.6	20.7	51.8	50	0.2	34.4	68.8

Table C.19 and Table C.20 provides the ADMS-Screen Screening Assessment results at Sutton St Edmunds Farm for NO_2 and PM_{10}. The results for NO_2 indicate that the maximum annual mean and 99.8 percentile of 1-hour mean PECs were predicted at the location 535819,313285 and location 535869,313165 respectively. At both locations, the respective NO2 AQS objectives were exceeded. The maximum annual mean and 99.8th Percentile of 1-hour mean PECs for NO_2 predicted at the sensitive receptor (535689, 313190) are well below the long-term and short-term NO_2 AQS objectives. The results for PM_{10} indicate that the maximum annual mean and 90.4th percentile of 24-hour mean PECs at all assessed locations were well below the respective PM_{10} AQS objectives. Therefore, the impact of NO_2 and PM_{10} emissions from the biomass boilers at Sutton St Edmunds Farm are not expected to be significant at the existing human receptors.

Table C.19 – NO_2 Results of ADMS-Screen Screening Assessment at Sutton St Edmunds Farm

Receptor	The Annual Mean NO_2				The 99.8 Percentile of 1-hour Mean NO_2			
	AQS µg/m^3	PC µg/m^3	PEC µg/m^3	% PEC OF AQS	AQS µg/m^3	PC µg/m^3	PEC µg/m^3	% PEC OF AQS
Location with Maximum Values	40	50.5	59.97	149.9	200	580.2	599.2	299.6
Receptor (535689,313190)	40	3	12.5	31.3	200	58.0	77	38.5

Table C.20 – PM_{10} Results of ADMS-Screen Screening Assessment at Sutton St Edmunds Farm

Receptor	The Annual Mean PM_{10}				The 90 Percentile of 1-hour Mean PM_{10}			
	AQS µg/m^3	PC µg/m^3	PEC µg/m^3	% PEC OF AQS	AQS µg/m^3	PC µg/m^3	PEC µg/m^3	% PEC OF AQS
Location with Maximum Values	40	3.2	20.3	50.8	50	2.1	36.3	72.6
Receptor (535689,313190)	40	0.2	17.3	43.3	50	0.03	34.2	68.5

Table C.21 and Table C.22 provide the ADMS-Screen Screening Assessment results at Eastfields Farm for NO_2 and PM_{10}. The results for NO_2 indicate that the maximum annual mean and 99.8 percentile of 1-hour mean PECs were predicted at location 535007, 312336 where the respective NO_2 AQS objectives were exceeded.

However, the maximum annual mean and 99.8th Percentile of 1-hour mean PECs for NO_2 predicted at the sensitive receptor (535111,312252) are well below the long-term and short-term NO_2 AQS objectives. Therefore, the impact of NO_2 and PM_{10} emissions from the biomass boilers at Eastfields Farm are not expected to be significant at the existing human receptors

Table C.21 – NO_2 Results of ADMS-Screen Screening Assessment at Eastfields Farm

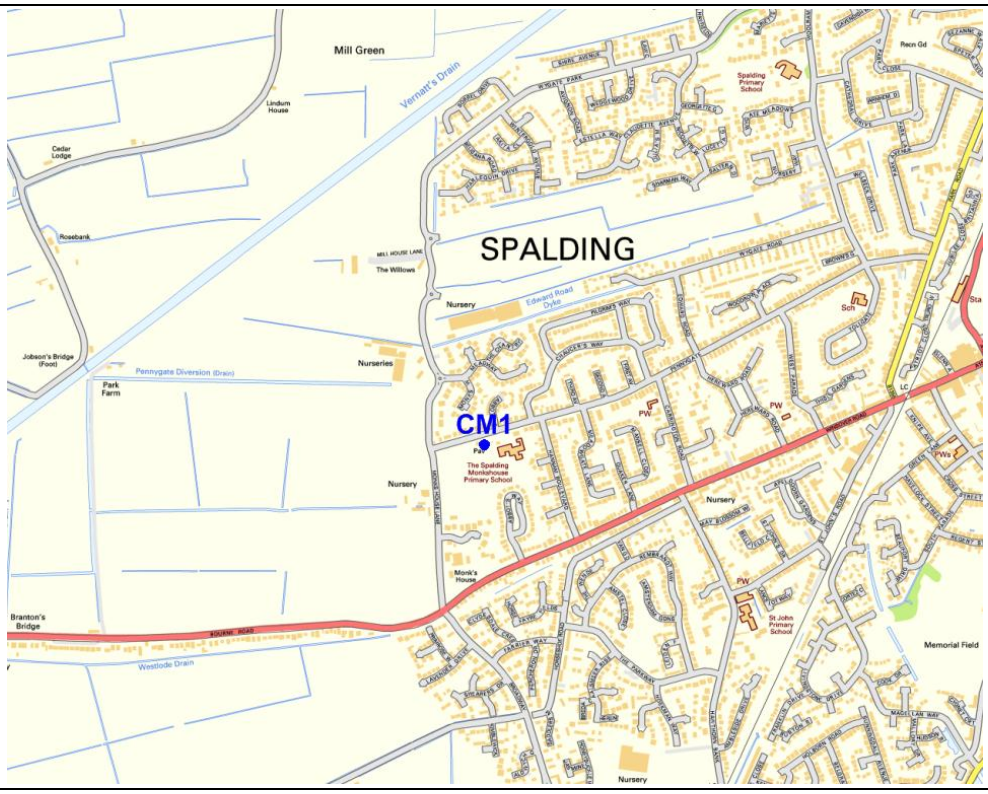
Receptor	The Annual Mean NO_2				The 99.8 Percentile of 1-hour Mean NO_2			
	AQS µg/m^3	PC µg/m^3	PEC µg/m^3	% PEC OF AQS	AQS µg/m^3	PC µg/m^3	PEC µg/m^3	% PEC OF AQS
Location with Maximum Values	40	462.6	472.1	1180.3	200	1610.5	1629.5	814.8
Receptor (535111,312252)	40	4.4	13.9	34.8	200	79.9	98.85	49.4

Table C.22 – PM_{10} Results of ADMS-Screen Screening Assessment at Eastfields Farm

Receptor	The Annual Mean PM_{10}				The 90 Percentile of 1-hour Mean PM_{10}			
	AQS µg/m^3	PC µg/m^3	PEC µg/m^3	% PEC OF AQS	AQS µg/m^3	PC µg/m^3	PEC µg/m^3	% PEC OF AQS
Location with Maximum Values	40	29.4	46.3	115.8	50	44.6	78.4	156.8
Receptor (535111,312252)	40	0.3	17.2	43.0	50	0.2	34	68.0

Appendix D: Map(s) of Monitoring Locations and AQMAs

Figure D.1 – Map of Automatic Monitoring Site: Spalding



Legend

● Automatic Monitoring Loation

Air Quality
Bureau Veritas
5th Floor
66 Prescott Street
London, E1 8HG

Location	Spalding
Title	**Diffusion Tube Locations**
By FL	**Approved** HS
Scale Not To Scale	**Job Ref** 6443719
Date July 2017	**Figure No.** D.1

Figure D. 2 – Map of Automatic Monitoring Site: Sutton Bridge

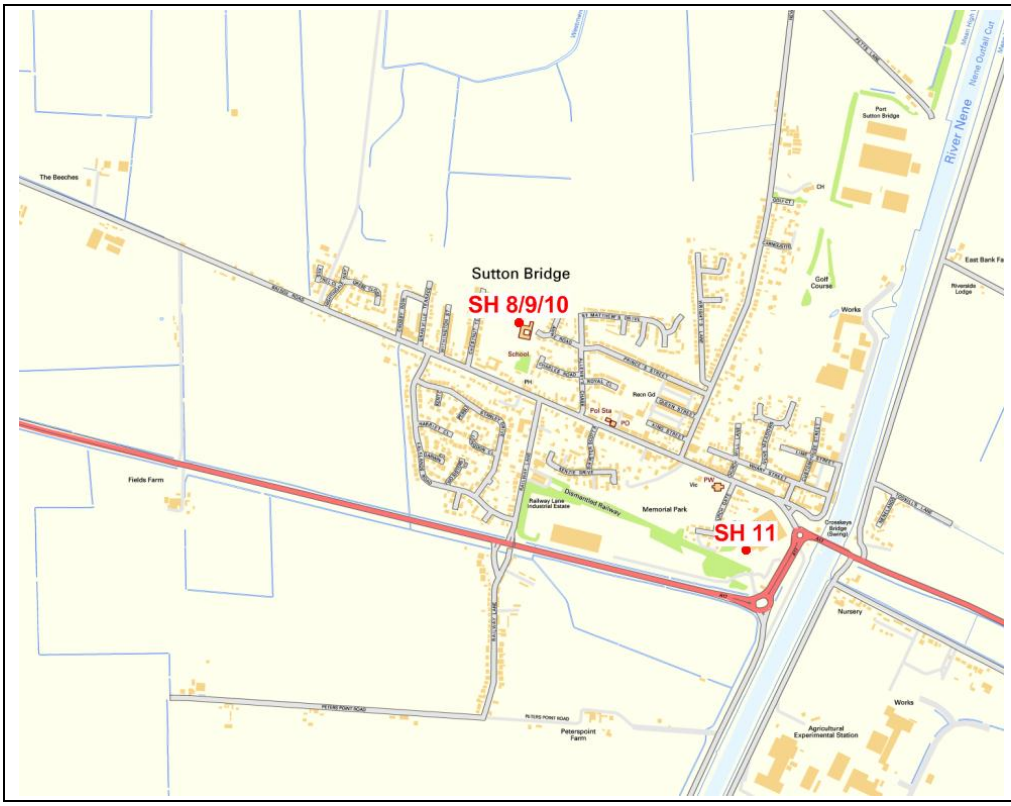
Legend

● Automatic Monitoring Loation

Air Quality
Bureau Veritas
5th Floor
66 Prescott Street
London, E1 8HG

Location	**Sutton Bridge**
Title	**Diffusion Tube Locations**
By FL	**Approved** HS
Scale Not To Scale	**Job Ref** 6443719
Date July 2017	**Figure No.** D.2

Figure D. 3 – Map of Non-Automatic Monitoring Site: Sutton Bridge



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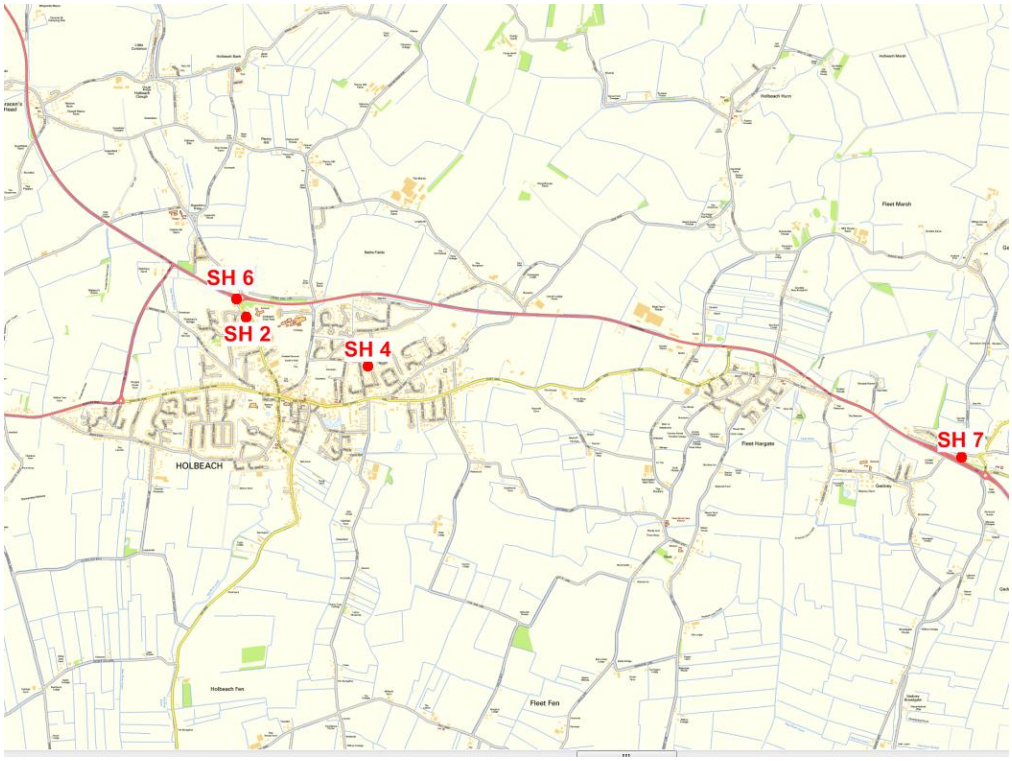
Diffusion Tube Locations

Air Quality
Bureau Veritas
5th Floor
66 Prescott Street
London, E1 8HG

Location	**Sutton Bridge**
Title	**Diffusion Tube Locations**
By FL	**Approved** HS
Scale Not To Scale	**Job Ref** 6443719
Date July 2017	**Figure No.** D.3

Figure D. 4– Map of Non-Automatic Monitoring Sites: Holbeach and Gedney



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Diffusion Tube Locations

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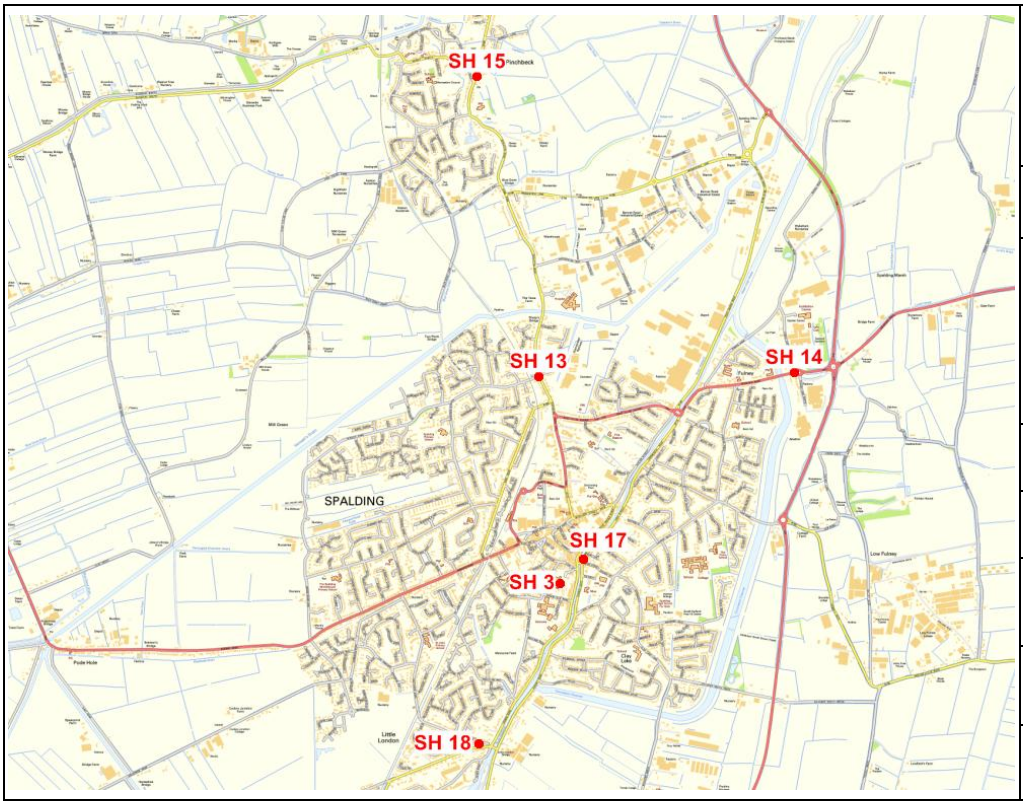
London, E1 8HG

Location	**Holbeach and Gedney**
Title	**Diffusion Tube Locations**
By FL	**Approved** HS
Scale Not To Scale	**Job Ref** 6443719
Date July 2017	**Figure No.** D.4

Figure D. 5 – Map of Non-Automatic Monitoring Sites: Spalding and Pinchbeck



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Diffusion Tube Locations

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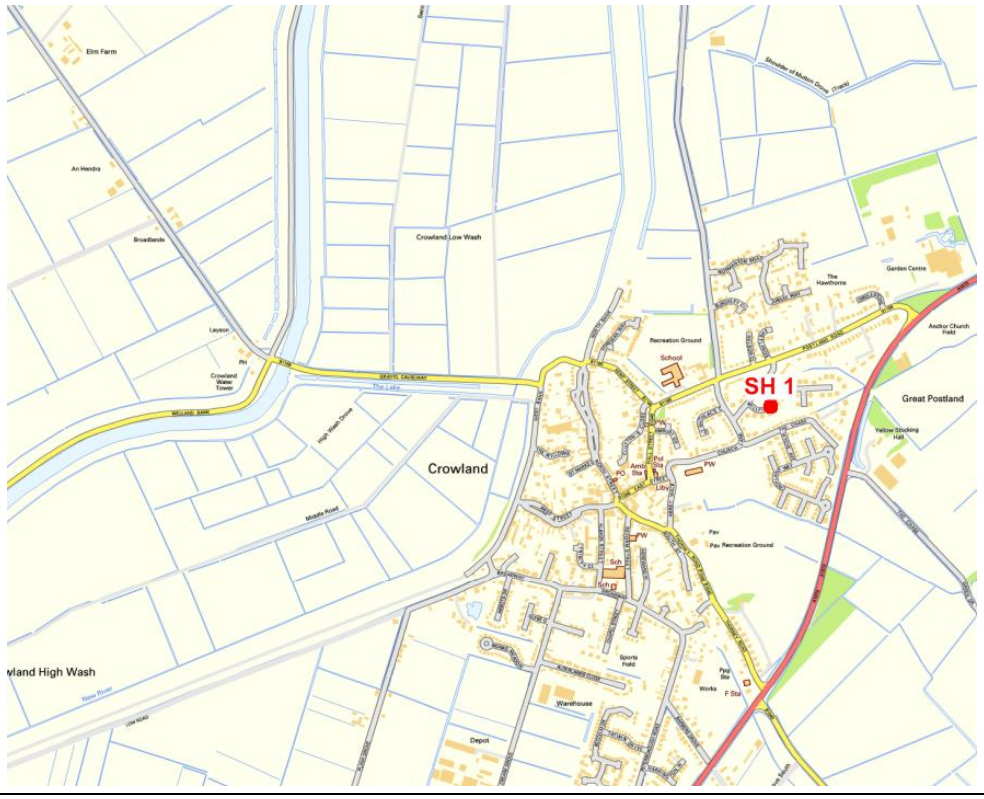
5th Floor
66 Prescott Street
London, E1 8HG

Location	**Spalding and Pinchbeck**
Title	**Diffusion Tube Locations**
By FL	**Approved** HS
Scale Not To Scale	**Job Ref** 6443719
Date July 2017	**Figure No.** D.5

Figure D. 6 – Map of Non-Automatic Monitoring Site: Crowland



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Diffusion Tube Locations

Air Quality
Bureau Veritas
5th Floor
66 Prescott Street
London, E1 8HG

Location	**Crowland**
Title	**Diffusion Tube Locations**
By FL	**Approved** HS
Scale Not To Scale	**Job Ref** 6443719
Date July 2017	**Figure No.** D.6

Figure D. 7 – Map of Non-Automatic Monitoring Sites: Donington

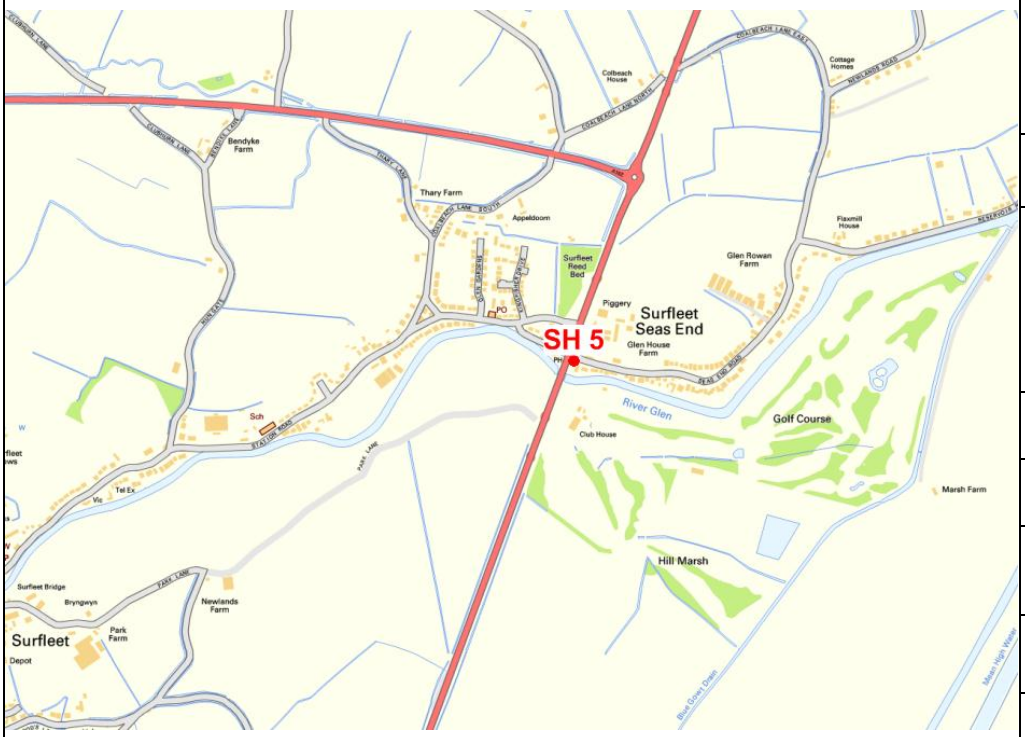
Legend

Diffusion Tube Locations

Air Quality
Bureau Veritas
5th Floor
66 Prescott Street
London, E1 8HG

Location	**Donington**
Title	**Diffusion Tube Locations**
By FL	**Approved** HS
Scale Not To Scale	**Job Ref** 6443719
Date July 2017	**Figure No.** D.7

Figure D. 8 – Map of Non-Automatic Monitoring Sites: Surfleet



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Diffusion Tube Locations

Air Quality
Bureau Veritas
5th Floor
66 Prescott Street
London, E1 8HG

Location	**Surfleet**
Title	**Diffusion Tube Locations**
By FL	**Approved** HS
Scale Not To Scale	**Job Ref** 6443719
Date July 2017	**Figure No.** D.8

Appendix E: Summary of Air Quality Objectives in England

Table E.1 – Air Quality Objectives in England

Pollutant	Air Quality Objective[4]	
	Concentration	Measured as
Nitrogen Dioxide (NO_2)	200 µg/m^3 not to be exceeded more than 18 times a year	1-hour mean
	40 µg/m^3	Annual mean
Particulate Matter (PM_{10})	50 µg/m^3, not to be exceeded more than 35 times a year	24-hour mean
	40 µg/m^3	Annual mean
Sulphur Dioxide (SO_2)	350 µg/m^3, not to be exceeded more than 24 times a year	1-hour mean
	125 µg/m^3, not to be exceeded more than 3 times a year	24-hour mean
	266 µg/m^3, not to be exceeded more than 35 times a year	15-minute mean

[4] The units are in microgrammes of pollutant per cubic metre of air (µg/m^3).

Glossary of Terms

Abbreviation	Description
AQAP	Air Quality Action Plan - A detailed description of measures, outcomes, achievement dates and implementation methods, showing how the local authority intends to achieve air quality limit values'
AQMA	Air Quality Management Area – An area where air pollutant concentrations exceed / are likely to exceed the relevant air quality objectives. AQMAs are declared for specific pollutants and objectives
AQS	Air Quality Standard
ASR	Air quality Annual Status Report
Defra	Department for Environment, Food and Rural Affairs
DMRB	Design Manual for Roads and Bridges – Air quality screening tool produced by Highways England
EU	European Union
FDMS	Filter Dynamics Measurement System
LAQM	Local Air Quality Management
NO_2	Nitrogen Dioxide
NO_x	Nitrogen Oxides
PC	Process Contribution
PEC	Predicted Environmental Concentration
PM_{10}	Airborne particulate matter with an aerodynamic diameter of 10µm (micrometres or microns) or less
$PM_{2.5}$	Airborne particulate matter with an aerodynamic diameter of 2.5µm or less
QA/QC	Quality Assurance and Quality Control
SO_2	Sulphur Dioxide
AQMAU	Air Quality Modelling and Assessment Unit

References

- Draft South East Lincolnshire Local Plan 2011-2036
- Local Air Quality Management; Technical Guidance LAQM.TG(16) Available at: http://laqm.defra.gov.uk/technical-guidance/
- AEA Energy and Environment (2011) AEA_DifTPAB_v04.xls, Available at: www.uk-air.com
- http://shollandair.aeat.com/
- National Diffusion Tube Bias Adjustment Factor Spreadsheet, version 06/17 published in June 2017
- South Holland District Council 2016 Annual Status Report