



2009 Air Quality Updating and Screening Assessment for North Lincolnshire Council

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

July 2009

North Lincolnshire Council - Draft

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Executive Summary

The 2009 Updating and Screening Assessment has not highlighted any new exceedances of the air quality objectives applicable to LAQM **in England** as set out in the Air Quality (England) Regulations 2000 (SI 928), The Air Quality (England) (Amendment) Regulations 2002 (SI 3043).

This report reconsiders all potential sources of pollution (primarily industry and traffic related sources) with respect to PM₁₀ (particulate matter), nitrogen dioxide, sulphur dioxide, carbon monoxide, benzene, 1,3-butadiene and lead. The main purpose of the review is to identify those aspects that have changed since completion of the last round of Review and Assessment.

Continuing problems have been highlighted within the local area relating to PM₁₀ and at present have resulted in the declaration of two Air Quality Management Areas; (AQMA)

- 2005 Scunthorpe AQMA for breaches of PM₁₀ daily mean objective.
- 2008 Low Santon AQMA for breaches of the PM₁₀ annual mean objective.

Problems persist at both of these locations although improvements are beginning to show. Daily objective breaches are becoming less frequent throughout the AQMA although East Common Lane, Scunthorpe and Santon, which surround the integrated Steelworks site, still exceed the objective. The annual mean objective at Santon has also seen a decrease since 2006 and although still above permitted levels is beginning to show improvements.

A Detailed Assessment for Santon will be submitted to DEFRA in December 2009, which will give a more detailed account of the current situation. An action plan review for the daily mean AQMA is also due for submission later this year.

All other sources assessed have not met the criteria required to proceed to a detailed assessment or declare an Air Quality Management Area. These will be assessed again in the next round of review and assessment to ensure that they do not have a detrimental effect on the air quality of North Lincolnshire.

Table of contents

1	Introduction	4
1.1	Description of Local Authority Area	4
1.2	Purpose of Report	4
1.3	Air Quality Objectives	4
1.4	Summary of Previous Review and Assessments	6
2	New Monitoring Data	8
2.1	Summary of Monitoring Undertaken	8
2.2	Comparison of Monitoring Results with AQ Objectives	14
3	Road Traffic Sources	23
3.1	Narrow congested streets with residential properties close to the kerb	23
3.2	Busy streets where people may spend 1-hour or more close to traffic	23
3.3	Roads with high flow of buses and/or HGVs.	24
3.4	Junctions and busy roads	25
3.5	New roads constructed or proposed since the last round of review and assessment	26
3.6	All roads with significantly changed traffic flows.	26
3.7	Bus and coach stations	27
4	Other Transport Sources	28
4.1	Airports	28
4.2	Railways (diesel and steam trains)	29
4.3	Ports (shipping)	30
5	Industrial Sources	31
5.1	New or Proposed Industrial Installations	31
5.2	Major fuel (petrol) storage depots	37
5.3	Petrol stations	37
5.4	Poultry farms	38
6	Commercial and Domestic Sources	39
6.1	Biomass combustion – Individual Installations	39
6.2	Biomass combustion – Combined Impacts	40
6.3	Domestic Solid-Fuel Burning	40
7	Fugitive or Uncontrolled Sources	42
8	Conclusions and Proposed Actions	43
8.1	Conclusions from New Monitoring Data	43
8.2	Conclusions from Assessment of Sources	44
8.3	Proposed Actions	45
9	References	46

Appendices

Appendix A: QA/QC Data

Appendix B: DMRB Calculations & Road Locations

Appendix C: Locations of Monitoring Stations

Appendix D: Diffusion Tubes

Appendix E: Current AQMAs

Appendix F: Bus Stations

Appendix G: Airports

Appendix H: Ports

Appendix I: NOX to NO2 Calculator

Appendix J: Bias Adjustment Calculations

1 Introduction

1.1 Description of Local Authority Area

North Lincolnshire is an area of around 85,000 hectares located on the southern side of the Humber estuary and occupying tracts of land on either side of the River Trent. Parliamentary Order created the administrative area of North Lincolnshire in March 1995 and on 1st April 1996 the new Unitary Authority area of North Lincolnshire came into being. North Lincolnshire covers a large, mainly agricultural area. The pattern of settlements in the area reflects this with market towns surrounded by many small villages. An important exception to this is the substantial urban area of Scunthorpe and the adjoining town of Bottesford. Almost half of North Lincolnshire's population, approximately 73,250 people, live in Scunthorpe and the adjacent town of Bottesford. Overall, 71 percent of the population live in this main urban area and other towns. The local economy of North Lincolnshire was built on traditional industries such as steel manufacturing and related industries and agriculture. More recently there has been the establishment of two oil refineries and the introduction of several gas fired power stations. The M180 motorway and several primary and strategic routes, including the A18 and A15, are located within North Lincolnshire. By rail there are regular freight movements to and from Scunthorpe Steelworks and Humber port related industries. With several wharf facilities along the banks of the Humber and the Trent, North Lincolnshire is well positioned to take advantage of water transport.

1.2 Purpose of Report

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

1.3 Air Quality Objectives

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

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

Pollutant	Air Quality Objective		Date to be achieved by
	Concentration	Measured as	
Benzene	16.25 µg/m ³	Running annual mean	31.12.2003
	5.00 µg/m ³	Running annual mean	31.12.2010
1,3-Butadiene	2.25 µg/m ³	Running annual mean	31.12.2003
Carbon monoxide	10.0 mg/m ³	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	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 (PM₁₀) (gravimetric)	50 µg/m ³ , not to be exceeded more than 35 times a year	24-hour mean	31.12.2004
	40 µg/m ³	Annual mean	31.12.2004
Sulphur dioxide	350 µg/m ³ , not to be exceeded more than 24 times a year	1-hour mean	31.12.2004
	125 µg/m ³ , not to be exceeded more than 3 times a year	24-hour mean	31.12.2004
	266 µg/m ³ , not to be exceeded more than 35 times a year	15-minute mean	31.12.2005

1.4 Summary of Previous Review and Assessments

Previous rounds of review and assessment have led to more in depth assessments of a number of different pollutants and sources. Summaries of these study findings are as follows;

Updating and Screening Assessment (USA) 2003

Results of monitoring and the screening exercises in this Review & Assessment, proposed that a further detailed assessment of PM₁₀ would be conducted in relation to the following: -

- Industrial emissions of PM₁₀ in Scunthorpe.
- Emissions of PM₁₀ from quarries and landfills in Barnetby.
- Emissions of PM₁₀ and SO₂ from domestic solid fuel burning in Keadby.
- Industrial emissions of SO₂ in Killingholme
- Industrial emissions of Benzene in Killingholme and Scunthorpe

Detailed Assessment 2004

Continuing on from the 2003 USA recommendations for each pollutant were as follows;

Benzene

To gather further data in both Scunthorpe and Killingholme and review and report findings in the next annual Progress Report.

Sulphur Dioxide

To gather further data at Keadby and review and report findings in the next annual Progress Report. No further action was required in respect of sulphur dioxide at Killingholme. No further action was required in connection with stationary railway locomotives at Scunthorpe Station.

PM₁₀

An Air Quality Management Area or Areas shall be defined and then designated for the Scunthorpe area where there is likely exceedence of the Air Quality Objectives. Gather additional PM₁₀ data at Keadby and subsequently review and report conclusions in the next annual Progress Report. No further action is required in respect of PM₁₀ in Croxton/Barnetby.

Benzene Detailed Assessment 2005

The annual mean of benzene concentrations at relevant locations did not exceed the 2010 objective, although at one location at Santon, Scunthorpe some monthly concentrations did exceed 5µg/m³ and consequently further investigations were required. The monthly concentrations at certain boundary locations were greater than 5µg/m³ at installations in Scunthorpe and Killingholme, however where there were no relevant receptors and exposure is unlikely to effect human health, no further investigation was required in relation to air quality assessment.

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Progress Report 2005

From the results of the monitoring data in this Progress Report, it was proposed that the following actions be implemented; A benzene diffusion tube survey would continue for a further 12-month period commencing March 2005 at two sites in Scunthorpe identified as having the potential to breach the 2010 annual mean objective of $5\mu\text{g}/\text{m}^3$.

The two locations identified in Scunthorpe as likely to breach the annual mean air quality objective for nitrogen dioxide of $40\mu\text{g}/\text{m}^3$, a chemiluminescence NO_x analyser was installed.

The council will declare an Air Quality Management Area for PM_{10} in Scunthorpe, in relation to the 24 hour mean objective of $50\mu\text{g}/\text{m}^3$ not to be exceeded more than 35 times a year, and continue with the further assessment work to determine the relative contributions of different sources of PM_{10} .

Updating & Screening Assessment 2006

From the results of the monitoring and the screening exercises in this Review & Assessment, it was proposed that detailed assessments would be conducted in relation to the following: -

- Industrial emissions of 1,3-Butadiene in the vicinity of the Conoco Phillips Ltd and Total UK Ltd Oil Ltd Refineries, North Killingholme.
- Industrial emissions of Lead in the vicinity of the Corus (UK) Ltd Integrated Steelworks, Scunthorpe.
- Emissions of Nitrogen Dioxide in the vicinity of Doncaster Rd / Hilton Avenue, Scunthorpe, Junction of Brigg Road and A18, Mortal Ash, Scunthorpe

Detailed Assessment PM_{10} 2008

The results presented indicate that the annual PM_{10} objective has been breached in the vicinity of the Low Santon TEOM monitoring station in 2006 and 2007. The mean concentration recorded between October and December 2005 was also greater than $40\mu\text{g}/\text{m}^3$.

Further Assessment of PM_{10} 2008

Further assessment of past monitoring data recorded at continuous sites within the AQMA Scunthorpe shows levels remain non-compliant with the short-term objective. The Council has no current plans to move the monitors within the AQMA.

Air Quality Progress Report 2008

The progress report concluded that NO_2 concentrations within Killingholme had decreased and there had been no significant changes to road traffic flows or other transportation.

2 New Monitoring Data

2.1 Summary of Monitoring Undertaken

2.1.1 Automatic Monitoring Sites

North Lincolnshire Council currently has a number of automatic monitoring sites located within its boundary which include:

1. Gallagher Retail Park

This machine is an Airpointer and automatically measures oxides of nitrogen (NO_x). The monitoring station is located on the southeastern corner of the Gallagher Retail Park, which is on the western edge of Scunthorpe. The station is 15m north of Doncaster Road.

2. Allanby Street

This monitoring station is located on a small patch of grass, adjacent to a local car park and close to Scunthorpe Town Centre. PM₁₀ is monitored at this site using a TEOM 1400a. The High Street is 105m from the site and Britannia Corner; a busy road junction is 153m away. It is approximately 1 km northwest of the steelworks site boundary.

3. Kingsway House

This machine is an Airpointer and automatically measures oxides of nitrogen (NO_x). This monitoring station is located on a small patch of grass outside a block of flats known as Kingsway House, at the junction of Ashby Road and Lloyds Avenue in Scunthorpe. The Queensway roundabout is 67m to the north of the site (at its closest point) and is the intersection for the A18 and Ashby Road.

4. Lincoln Gardens

This site is located within the grounds of Lincoln Gardens Primary School and the closest road is approximately 72m north of the site. PM₁₀ is monitored at this site using a TEOM 1400a. The site is approximately 2.5km west of the closest boundary of the steelworks. To the east of the site is a park with the remaining area being residential.

5. Scunthorpe Town AURN (Rowland Road)

This monitoring station is housed within an enclosed air-conditioned unit in the northeast of Scunthorpe approximately 10 metres to the north of Rowland Road. The nearest busy road is Brigg Road (A1029), at its closest point it is 124 metres to the northeast of the monitoring site.

The monitoring equipment at the station consists of an Enviro-Technology Services model 100A Fluorescent sulphur dioxide (SO₂) analyser, a Monitor Labs Inc ML9841B oxides of nitrogen chemiluminescence analyser and a Rupprecht & Patterschnick TEOM 1400a PM₁₀ monitor. The logging system used is an Odessa DSM3260. In addition wind direction and wind speed are measured at this site. The PM₁₀, NO_x and SO₂ analysers are affiliate members of the AURN (Automatic and Urban

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Rural Network). The site also comprises of an equivalent Partisol Particulate Monitor, a National Physics Laboratory funded Heavy Metals sampler and a Digitel DHA-80 High volume PAH sampler

6. East Common Lane

PM₁₀ is monitored at this site using a TEOM 1400a. This site is located behind a block of flats, 34m south of East Common Lane, to the west of the site is a residential area; whilst to the northeast and southeast are several industrial estates. The site is approximately 500 m west of the steelworks site boundary.

7a. Low Santon

This monitoring station is housed within an enclosed air-conditioned unit to the north east of Scunthorpe on the eastern boundary of the steelworks. Dawes Lane is 5m to the south of the station, running from a rural location in the east through the steelworks and into Scunthorpe. A raised embankment 5m north of the site carries freight traffic along one of the major rail lines into the steelworks. The surrounding area consists of arable fields with a number of trees and to the east, a small residential area. The monitoring equipment at this station consists of a Signal Ambitech Ambirak analyser, monitoring sulphur dioxide and oxides of nitrogen, and a Rupprecht & Patterschnick TEOM 1400a monitoring PM₁₀. In addition, a Digitel DHA-80 High volume PAH sampler began operation at the site in September 2007.

A Partisol 2000 was installed in April 2008 to measure concentrations of heavy metals. Further to this an additional Rupprecht & Patterschnick TEOM 1400a was installed in June 2008 to monitor PM_{2.5}.

7b. High Santon

This monitoring station is located in a domestic garden 400m from the Low Santon monitoring station. The site comprises of a Partisol 2000 equivalent particulate monitor and was installed in January 2008.

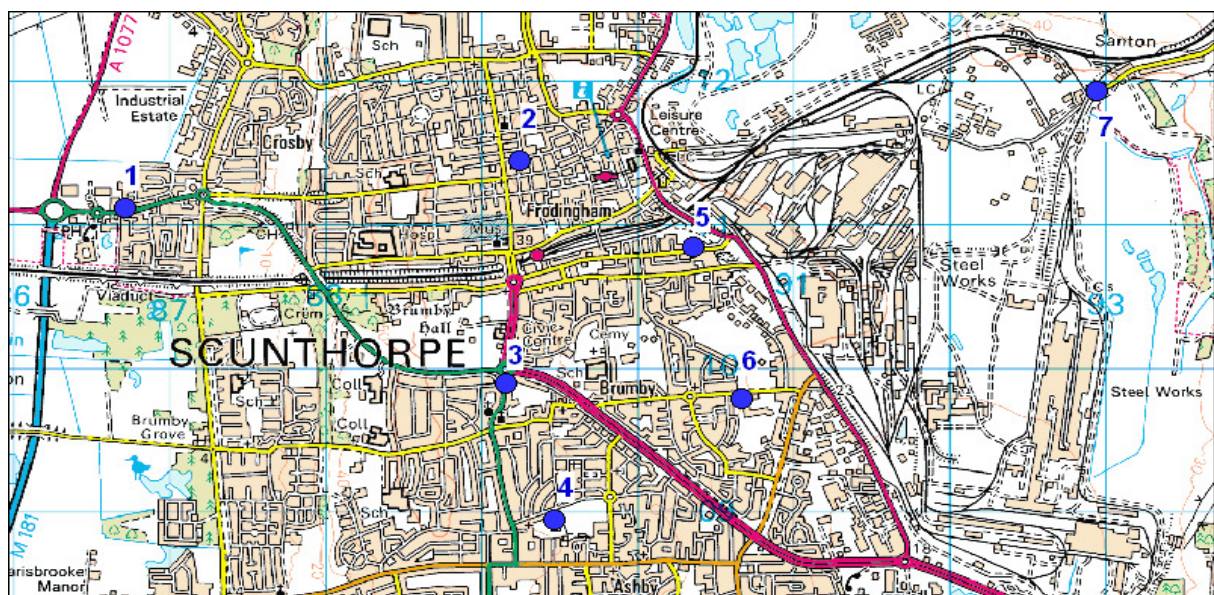


Figure 1 Location of Monitoring Sites in Scunthorpe

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8. Appleby Village

This site is located on a playing field in the village of Appleby, see figure 2; the village is surrounded by arable fields and open fields and is 6 km northeast of Scunthorpe. PM₁₀ is monitored at this site using a TEOM 1400a.

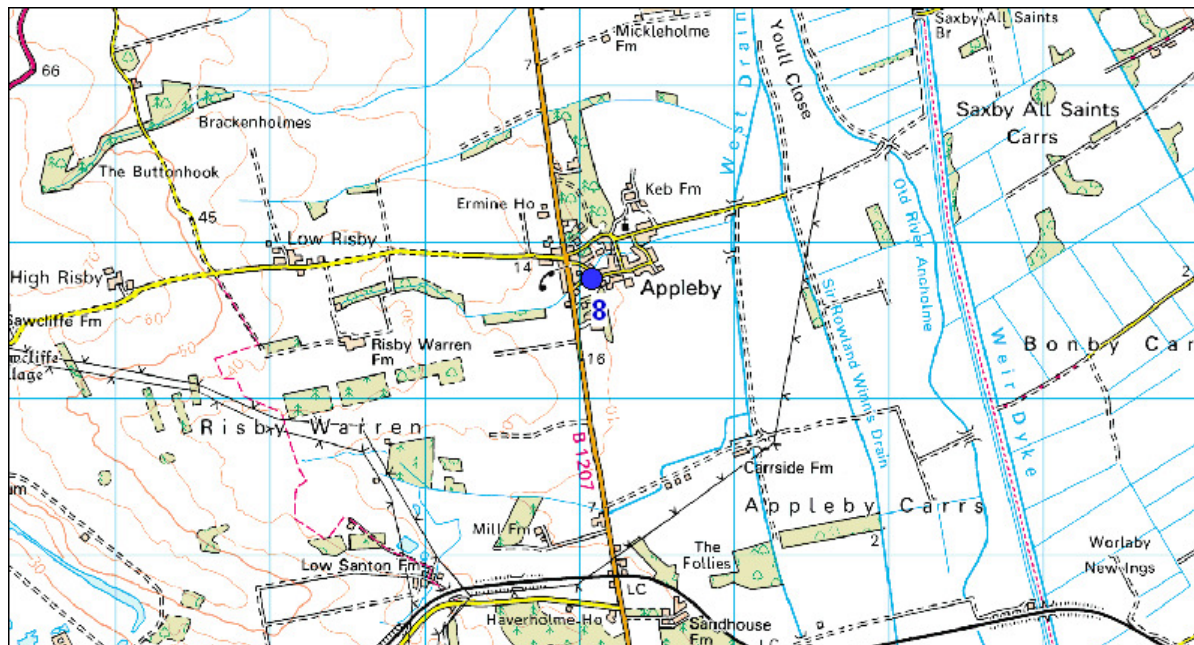


Figure 2 Location of Appleby Site

9. Broughton

The site is located within an Anglian Water enclosure within a residential area in the village of Broughton, see figure 3. PM₁₀ is monitored at this site using a TEOM 1400a. It is approximately 3 km east of the steelworks site. The B1207 is 500 m west of the site and the area between this road and the steelworks is comprised of woods and fields.



Figure 3 Location of Broughton Monitoring Site

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10. Killingholme

The site is located within the grounds of South Killingholme Primary School and is approximately 200 m north of the dual-carriage A160; see figure 4. Two refineries are located to the northeast and east of the site. The site is approximately 4 km west of the River Humber and the Immingham docks. The site is approximately 20 km east of the Air Quality Management Area in Scunthorpe. Sulphur dioxide, oxides of nitrogen and PM₁₀ are the three pollutants measured at this site. In addition wind direction and speed, relative humidity, pressure and temperature are also measured. A pumped Benzene Tubes was installed in September 2008 as part of the National Hydrocarbon Network.

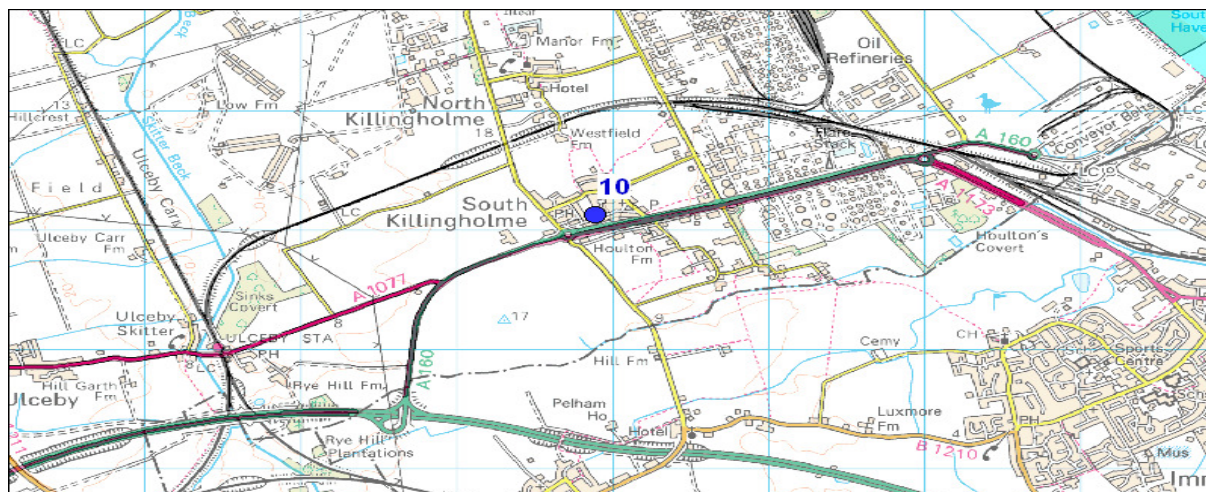


Figure 4 Location of Killingholme Monitoring Site

Location maps for remaining sites are available within Appendix C.

Table 2.1 Details of Automatic Monitoring Sites

Site Name	Site Type	OS Grid Ref	Pollutants Monitored	In AQM A?	Relevant Exposure? (Y/N with distance (m) to relevant exposure)	Distance to kerb of nearest road (N/A if not applicable)	Worst-case Location ?
1. Gallagher Retail park	Urban	X486696 Y411105	NO _x	N	Y (39m)	10m	N
2. Allanby St	Urban	X489228 Y411447	PM ₁₀	N	Y (15m)	3m	N
3. Kingsway House	Urban	X489145 Y409889	NO _x	Y	Y (5m)	2m	N
4. Lincoln Gardens	Urban	X489464 Y408939	PM ₁₀	Y	Y (18m)	N/a	N
5. Scunthorpe Town	Urban Industrial	X490320 Y410831	PM ₁₀ , SO ₂ , NO _x	Y	Y (21m)	7m	N
6. East Common Lane	Urban Industrial	X490663 Y409789	PM ₁₀	Y	Y (3m)	28m	N
7a. Low Santon	Industrial	X492945 Y411931	PM ₁₀ , SO ₂ , NO _x , PM _{2.5}	Y	Y (41m)	5m	N
7b. High Santon	Industrial	X492945 Y411931	PM ₁₀	Y	Y (8m)	5m	N
8. Appleby	Rural	X495075 Y414767	PM ₁₀	N	Y (17m)	N/a	N
9. Broughton	Rural	X496046 Y409410	PM ₁₀	N	Y (9m)	7m	N
10. Killingholme	Urban Industrial	X514880 Y416133	PM ₁₀ , Benzene, NO _x , SO ₂	N	Y (9m)	N/a	N

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2.1.2 Non-Automatic Monitoring

North Lincolnshire Council currently has a nitrogen dioxide diffusion tube network consisting of 39 sites. Maps and details of the tube locations can be found in Appendix C. The diffusion tubes are supplied and analysed by South Yorkshire Laboratory, the chemical absorbent used consists of 50% Acetone and 50% Triethanolamine.

North Lincolnshire Council has followed the guidance in relation to applying a bias adjustment calculation. 3 collocation studies are currently in progress within North Lincolnshire. All 3 were active in 2008. Sites include Scunthorpe Town AURN site an urban industrial site. Gallagher Retail Park an urban background site and Kingsway House another urban background site.

All 3 sites are situated at roadside locations of which Gallagher Retail Park and Kingsway House collocate with Airpointers and Scunthorpe Town with the AURN chemiluminescence NO_x analyser. The bias factor for 2008 was calculated using the Kingsway House study due to the similarities of its location and background with ongoing studies within North Lincolnshire. Details of the bias adjustment can be found in appendix 4. Data capture over the period was good for both the automatic and non-automatic methods allowing for the local bias to be applied.

A summary of precision results for nitrogen dioxide diffusion tube collocation studies indicates that South Yorkshire Laboratories operates to a high level of precision in accordance with the Laboratory Workplace Analysis Scheme for Proficiency, (WASP) scheme.

Table 2.2 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)	Worst-case Location ?
Tube 1	Urban Kerbside	X489099 Y411723	NO ₂	N	3m	1m	N
Tube 2	Urban Roadside	X489394 Y411927	NO ₂	N	18m	1m	N
Tube 3	Rural Roadside	X486618 Y412252	NO ₂	N	N/a	12m	N
Tube 4	Suburban Kerbside	X478038 Y403957	NO ₂	N	1m	1m	N
Tube 5	Suburban Roadside	X483642 Y410643	NO ₂	N	20m	2m	N
Tube 6	Suburban Roadside	X486690 Y411112	NO ₂	N	42m	16m	N
Tube 7	Suburban Roadside	X486690 Y411112	NO ₂	N	42m	16m	N
Tube 8	Suburban Roadside	X486690 Y411112	NO ₂	N	42m	16m	N
Tube 9	Suburban Roadside	X486928 Y411156	NO ₂	N	12m	3m	N

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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)	Worst-case Location ?
Tube 10	Suburban Kerbside	X487239 Y411259	NO ₂	N	9m	2m	N
Tube 11	Urban Roadside	X488547 Y411249	NO ₂	N	30m	2m	N
Tube 12	Urban Roadside	X489190 Y411285	NO ₂	N	4m	2m	N
Tube 13	Urban Kerbside	X489209 Y411118	NO ₂	N	4m	3m	N
Tube 14	Urban Kerbside	X489247 Y410355	NO ₂	N	20m	3m	N
Tube 15	Urban Kerbside	X489777 Y409702	NO ₂	N	20m	5m	N
Tube 16	Urban Kerbside	X488490 Y409963	NO ₂	N	8m	1m	N
Tube 17	Urban Roadside	X489145 Y409889	NO ₂	N	2m	5m	N
Tube 18	Urban Roadside	X489145 Y409889	NO ₂	N	2m	5m	N
Tube 19	Urban Roadside	X489145 Y409889	NO ₂	N	2m	5m	N
Tube 20	Urban Kerbside	X489172 Y409926	NO ₂	N	20m	2m	N
Tube 21	Urban Kerbside	X489112 Y409463	NO ₂	N	15m	1m	N
Tube 22	Urban Kerbside	X489242 Y408695	NO ₂	N	3m	1m	N
Tube 23	Suburban Kerbside	X489735 Y407880	NO ₂	N	9m	4m	N
Tube 24	Suburban Kerbside	X409638 Y408632	NO ₂	N	9m	4m	N
Tube 25	Urban Roadside	X491628 Y408658	NO ₂	N	N/a	2m	N
Tube 26	Suburban Roadside	X491737 Y408378	NO ₂	N	N/a	2m	N
Tube 27	Industrial Roadside	X491838 Y408641	NO ₂	N	N/a	9m	N
Tube 28	Industrial Roadside	X491859 Y408645	NO ₂	N	N/a	9m	N
Tube 29	Urban Kerbside	X499975 Y407421	NO ₂	N	60m	3m	N
Tube 30	Suburban Kerbside	X500430 Y407270	NO ₂	N	10m	2m	N
Tube 31	Industrial Roadside	X515363 Y416085	NO ₂	N	20m	5m	N
Tube 32	Industrial Kerbside	X515280 Y416085	NO ₂	N	10m	2m	N
Tube 33	Industrial Roadside	X514645 Y417363	NO ₂	N	5m	3m	N
Tube 34	Suburban Kerbside	X503048 Y421907	NO ₂	N	15m	1m	N
Tube 35	Suburban Kerbside	X497833 Y421043	NO ₂	N	7m	1m	N
Tube 36	Industrial Roadside	X490316 Y410837	NO ₂	N	32m	6m	N
Tube 37	Industrial Roadside	X490316 Y410837	NO ₂	N	32m	6m	N
Tube 38	Industrial Roadside	X490316 Y410837	NO ₂	N	32m	6m	N
Tube 39	Industrial Roadside	X490080 Y411258	NO ₂	N	36m	2m	N

2.2 Comparison of Monitoring Results with AQ Objectives

2.2.1 Nitrogen Dioxide

Automatic Monitoring Data

Site ID	Location	Within AQMA?	Proportion of year with valid data %	Annual mean concentrations ($\mu\text{g}/\text{m}^3$)		
				2006	2007	2008
1	Gallagher Retail Park	N	100%	23.7	24.6	27.9
3	Kingsway House	N	100%	22.3	31.6	32
7a	Low Santon	N	95%	24.7	22.8	20.3
5	Scunthorpe Town	N	97%	19.6	17.8	18.7
10	Killingholme	N	92%	20.7	21.9	21.9

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

North Lincolnshire Council currently has no AQMAs designated for breaches of Air Quality objectives relating to Nitrogen Dioxide. The five automatic monitoring stations detailed in Table 2.3a have all achieved a data capture of greater than 90% allowing the results to be accepted as annual means. All five monitoring stations captured annual mean results less than the permitted $40\mu\text{g}/\text{m}^3$. Gallagher Retail Park and Kingsway House witnessed increases of the annual mean in 2008. Both sites are urban background locations situated on major roads. Details of these increases will be highlighted within the transport source section of this report. The locations of these monitoring stations can be found in appendix C of this report.

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Site ID	Location	Within AQMA?	Proportion of year with valid data %	Hourly mean exceedance >200µg/m ³		
				2006	2007	2008
1	Gallagher Retail Park	N	100%	0	0	0
3	Kingsway House	N	100%	0	0	8
7	Santon	N	95%	0	1	0
5	Scunthorpe Town	N	97%	0	0	0
10	Killingholme	N	92%	0	0	0

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

Monitoring station results for the hourly mean concentrations showed compliant concentrations at all five stations. Only Kingsway House witnessed any breaches of the hourly mean with 8 breaches of 200µg/m³. North Lincolnshire Council does not need to proceed to a detailed assessment for Nitrogen Dioxide. The locations of these monitoring stations can be found in Appendix C of this report.

North Lincolnshire Council - Draft

Diffusion Tube Monitoring Data

Table 2.4a Results of Nitrogen Dioxide Diffusion Tubes

Site ID	Location	Within AQMA?	Data Capture 2008 %	Annual mean concentrations
				2008 ($\mu\text{g}/\text{m}^3$) Adjusted for bias*
Tube 1	Frodingham Road	N	100	27
Tube 2	Normanby Road	N	67	25
Tube 3	A1077 Orbital Road	N	91	24
Tube 4	Epworth/ Belton	N	67	31
Tube 5	Keadby Bridge	N	91	30
Tube 6	Gallagher Retail Park	N	91	24
Tube 7	Gallagher Retail Park	N	91	25
Tube 8	Gallagher Retail Park	N	100	25
Tube 9	Doncaster Rd (Hilton)	N	50	29
Tube10	Scotter Road	N	67	34
Tube 11	Doncaster Rd (Royal)	N	100	27
Tube 12	Brittania Corner	N	91	34
Tube 13	Oswald Road	N	100	32
Tube 14	Ashby Road	N	83	24
Tube 15	Old Brumby	N	100	31
Tube 16	Lloyds Avenue	N	75	27
Tube 17	Kingsway House	N	100	34
Tube 18	Kingsway House	N	100	28
Tube 19	Kingsway House	N	100	30
Tube 20	Ashby Rd (A18)	N	100	31
Tube 21	Ashby Rd (Brumby)	N	91	34
Tube 22	Ashby Rd (Burringham)	N	91	31
Tube 23	Chancel Rd	N	75	28
Tube 24	Ashby High Street	N	100	29
Tube 25	Dudley Road	N	33	28
Tube 26	Lakeside Parkway	N	91	25
Tube 27	Brigg Rd/ A18	N	100	47
Tube 28	Ashby Lodge Pub	N	100	27
Tube 29	Barnard Avenue	N	91	30
Tube 30	Wrawby	N	100	28
Tube 31	Humber Rd, Chip Shop	N	100	30
Tube 32	Humber Rd, LP695	N	91	27
Tube 33	St Crispins Close	N	100	18
Tube 34	Holydyke	N	83	29
Tube 35	South Ferriby Main Rd	N	91	20
Tube 36	Rowland Road	N	100	23
Tube 37	Rowland Road	N	100	23
Tube 38	Rowland Road	N	100	26
Tube 39	Station Road (Netto)	N	91	29

*Calculated for bias using the Kingsway House Collocation Study

North Lincolnshire Council - Draft

The 2008-diffusion tube study has highlighted only one exceedance of the permitted Annual Mean Objective set at $40\mu\text{g}/\text{m}^3$. Tube 27 (Brigg Road/A18 Junction) was measured at $47\mu\text{g}/\text{m}^3$ after the bias calculation. Tube 27 is at an industrial background site close to a busy road junction.

The nearest relevant receptors include a newly developed residential estate located 300m to the South. Using the Nitrogen Dioxide fall off with distance documented in TG (09) the predicted levels of Nitrogen Dioxide 50m away from the exceedance is $27.6\mu\text{g}/\text{m}^3$ well within the permitted Air Quality Objective of $40\mu\text{g}/\text{m}^3$ and the necessary levels to proceed to a detailed assessment. North Lincolnshire Council does not need to proceed to a Detailed Assessment for Nitrogen Dioxide.

Tube 27 also sits adjacent to a pub, which is also a residential property with the owners living upstairs. As this pub has been identified in previous rounds of review and assessment a tube (28) has been placed on the wall of the pub. This tube is measured at $27\mu\text{g}/\text{m}^3$ and rules out the need to progress to a Detailed Assessment for Nitrogen Dioxide.

The locations of the problem sites can found in Appendix D of this report along with the co-located sites. Details of the Bias Adjustment calculations can be found within Appendix J of this report.

North Lincolnshire Council - Draft

2.2.2 PM₁₀

Table 2.5a Results of PM₁₀ Automatic Monitoring: Comparison with Annual Mean Objective

Site ID	Location	Within AQMA?	Data Capture 2008 %	Annual mean concentrations (µg/m ³)		
				2006 *	2007 *	2008
8	Appleby Village	N	98	-	24	22
9	Broughton	N	99	23	23	20
10	Killingholme	N	96	24	23	21
7a	Low Santon	Y	85	59	51	38
7b	High Santon	Y	89	-	31	31
5	Scunthorpe Town (AURN) TEOM	Y	94	30	25	21
5	Scunthorpe Town Partisol	y	93	23	22	21
4	Lincoln Gardens	Y	95	25	23	21
6	East Common Lane	Y	98	29	27	25
2	Allanby Street	N	98	28	24	22

Results from the 2008 PM₁₀ monitoring campaign show that no location has exceeded the permitted annual mean concentration of 40µg/m³ for PM₁₀. PM₁₀ has been measured by a TEOM using a factor of 1.3 for Indicative Gravimetric Equivalence for 2006 & 2007. 2008 has been inputted in to the Volatile Correction Model (VCM). All the sites excluding the Santon sites achieved a data capture of greater than 90% and as such a percentile has been calculated for the daily exceedance values at Santon.

The Santon site is located close to the boundary of a large industrial complex and has been highlighted as an area, which exceeded air quality objectives in previous years. The Volatile Correction Model has been applied to the 2008 data showing compliance with the annual mean objective. Previous issues had led to the declaration of the 2008 Low Santon AQMA for breaches of the annual mean objective. A detailed assessment for this location will be submitted to DEFRA in December 2009.

The concentrations of PM₁₀ measured using the equivalent Partisol shows similar levels to those measured using a TEOM. The Santon Partisol reached the desired data capture and can be accepted as a true level of particulate. The Scunthorpe Town Partisol located at the same site as the AURN analyser did not reach the required 90% data capture and has had a percentile calculation added to its daily exceedance value. Notwithstanding the current AQMAs North Lincolnshire Council does not need to proceed to a detailed assessment at this time.

North Lincolnshire Council - Draft

Table 2.5b Results of PM₁₀ Automatic Monitoring: Comparison with 24-hour Mean Objective

Site ID	Location	Within AQMA?	Data Capture 2008 %	Number of Exceedences of daily mean (50 µg/m ³) <i>If data capture < 90%, include the 90th %ile of hourly means in brackets.</i>		
				2006 *	2007 *	2008
8	Appleby Village	N	98	4	8	5
9	Broughton	N	99	2	5	6
10	Killingholme	N	96	8	6	11
7a	Low Santon	Y	85	158	133	73 (59)
7b	High Santon	Y	89	-	36	34 (51)
5	Scunthorpe Town (AURN) TEOM	Y	94	37	18	22
5	Scunthorpe Town Partisol	Y	93	7	15	24
4	Lincoln Gardens	Y	95	17	14	21
6	East Common Lane	Y	98	43	34	40
2	Allanby Street	N	98	23	11	20

East Common Lane and Santon were the only monitoring stations within North Lincolnshire to exceed the permitted level of daily breaches. East Common Lane within the existing 2005 AQMA exceeded 40 times in 2008. As the monitoring station is within the AQMA a detailed assessment has already been carried out. The majority of exceedances occurred during periods of Easterly winds in April and May 2008.

Exceedances of the daily mean objective at Santon have been decreasing since 2006 showing 73 using the VCM in 2008. Santon did not achieve the desired data capture although the percentile calculation is not relevant due to the number of exceedances within the data captured. The exceedance of the Air Quality Objectives at Santon will be investigated during the forthcoming further assessment due to be submitted to DEFRA in December 2009.

Santon has continued to be the major exceedance within the monitoring network for both PM₁₀ objectives. As Air Quality Management Areas have already been declared for these locations no detailed assessment needs to be carried out at this time, progress at these sites will be monitored, improved and reported through the current review and assessment program; 2009 Low Santon Further Assessment. 2009 Action Plan Review and the 2010 Progress Report. The locations of these monitoring stations can be found within Appendix C of this report.

North Lincolnshire Council - Draft

2.2.3 Sulphur Dioxide

Table 2.6a Results of SO₂ Monitoring: Comparison with Air Quality Objectives

Site ID	Site Location	Data Capture %	Air Quality Objective (Percentile in Brackets)		
			35 - 15 Min Means >266µg /m ³	24 - Hourly Means >350µg /m ³	3 - 24-hr Means >125µg /m ³
5	Scunthorpe Town AURN	88.1	0 (144)	0 (106)	0 (49)
7a	Low Santon	95.2	0	0	0
10	Killingholme	63.3	15 (253)	0 (205)	1 (82)

Sulphur Dioxide monitoring in North Lincolnshire is carried out at 3 locations. All located close to the perimeter fence of industrial activity and a relevant indicator of public exposure around these industrial sites.

Santon monitoring station achieved the desired data capture and presented no exceedances of any Sulphur Dioxide objective. Scunthorpe Town AURN site and Killingholme did not achieve the desired data capture and the percentile calculations are highlighted in brackets in table 2.6a. The percentile calculations show no breaches of any of the objectives. Killingholme witnessed a pollution episode in April 2009, which was responsible for increasing the number of 15-minute breaches to 15. This episode was investigated and proved inconclusive and not attributable to the Oil Refineries, which surround the monitoring station. The percentile figure, although close to the objective, shows the monitoring to be compliant. The location of these monitoring stations can be found within Appendix C of this report.

North Lincolnshire Council does not need to proceed to any detailed assessments relating to Sulphur Dioxide at this time.

2.2.4 Benzene

North Lincolnshire Council currently operates a pumped Benzene tube system at Killingholme. The system is housed within the Killingholme Rollalong, which analyses PM₁₀, SO₂ and NO_x. Prior to this North Lincolnshire also operated a Benzene diffusion tube network used to predict any potential exceedances for the 2005 Updating and Screening assessment. This investigation is now complete leaving only the pumped tube in situ due to its proximity to nearby potential Benzene emitters. The location of this monitoring station can be found within Appendix C of this report.

The Killingholme study has been in place since September 2008. To date the results have shown that the running annual mean does not exceed 16.25µg/m³. The 2008 running annual mean was 0.851µg /m³, because of this North Lincolnshire Council does not need to proceed to a detailed assessment for Benzene.

North Lincolnshire Council - Draft

2.2.5 Other pollutants monitored

North Lincolnshire Council currently monitors PAHs (poly-aromatic hydrocarbons) and Heavy Metals at two locations within the county, Low Santon and the Scunthorpe Town (ST) site. Results for PAHs were as follows;

Table 2.7a PAH Concentrations

PAH Compound	2007 Santon ng/m ³	2007 ST ng/m ³	2008 Santon ng/m ³	2008 ST ng/m ³
Benzo(c)phenanthrene	0.305	0.1904	0.00001233	0.000175
Benzo(a)anthracene	2.5	1.608	3.0016	2.8633
Chrysene	2.9	1.538	3.515	3.33833
Cyclopenta(c,d)pyrene	0.525	0.404	0.6005	0.70635
Benzo(b)naph(2,1d)thiophene	0.113	0.0708	0.1655	0.2103
5MethylChrysene	0.17	0.0278	0.0012333	0.001616
Benzo(b+j)fluoranthene	4.9	2.6	8.783	4.566
Benzo(k)fluoranthene	1.5	0.7858	2.175	1.196
Benzo(e)pyrene	2.25	1.2275	3.545	2.53
Benzo(a)pyrene	2.2	1.165	8.3833	4.89
Perylene	0.725	0.37525	1.238	0.81333
Indeno(1,2,3cd)pyrene	2.4	1.5325	3.78	2.1
Dibenzo(ah.ac)anthracene	0.59	0.3045	0.93	0.503
Benzo(ghi)perylene	1.95	1.0316	3.3316	1.926
Anthanthrene	0.41	0.2320	0.557	0.4325
Dibenzo(al)pyrene	0.595	0.3755	0.0001983	0.00026
Dibenzo(ae)pyrene	0.48	0.259	0.0002533	0.00033667
Dibenzo(ai)pyrene	0.295	0.203	0.13846667	0.0003533
Dibenzo(ah)pyrene	0.205	0.0196	0.0114433	0.0002233
Coronene	0.675	0.3105	1.18666667	0.49171
Cholanthrene	0.072	0.0405	0.0001983	0.00026
Total	25.76	14.30	41.34	26.57

The Santon PAH monitoring site reports very high levels of PAHs. The target value for PAHs as Benzo(a)pyrene is 1ng/m³. The Scunthorpe Town site reports lower numbers yet still exceeds the DEFRA objectives. AEA Technology run both PAH sites within North Lincolnshire. The high concentrations are currently being investigated.

North Lincolnshire Council - Draft

North Lincolnshire Council also operates two Heavy Metals monitoring stations in partnership with the National Physics Laboratory. Results from both stations were as follows;

Table 2.7b Heavy Metal Concentrations

Heavy Metals	Santon 2008 ng/m ³	Scunthorpe Town ng/m ³
Arsenic (As)	0.85	0.58
Cadmium (Cd)	0.24	0.18
Chromium (Cr)	3.52	1.99
Copper (Cu)	6.8	5.4
Iron (Fe)	2050	650
Manganese (Mn)	111.3	25.7
Nickel (Ni)	1.18	1.61
Lead (Pb)	33.1	18.1
Platinum (Pt)	0.00	0.00
Vanadium (V)	4.48	1.78
Zinc (Zn)	44.6	25.8
Mercury (Hg)	0.06	0.04

Of the two pollutant groups monitored results at Santon are far higher than at Scunthorpe Town. This is true of other pollutants measured at Santon and Scunthorpe Town. The most likely explanation for this is that the Santon site is down wind of the Local Integrated Steelworks and the Scunthorpe Site is up wind of the prevailing wind direction. The location of these monitoring stations can be found within Appendix C of this report. Many of the pollutants measured will be present in releases from the Integrated Steel Works, which can be seen from both sets of results. Limits for the emission of Heavy Metals can be found below.

	Lead	Arsenic	Cadmium	Nickel	Mercury
Legislation	First Daughter Directive (1999/30/EC)	Fourth Daughter Directive (2004/107/EC)	Fourth Daughter Directive (2004/107/EC)	Fourth Daughter Directive (2004/107/EC)	Fourth Daughter Directive (2004/107/EC)
Limit / Target Value	0.5 µg/m ³ Limit value	6 ng/m ³ Target value	5 ng/m ³ Target value	20 ng/m ³ Target value	Not specified
Upper assessment threshold in percent of the target value	70% 0.35 µg/m ³	60% 3.6 ng/m ³	60% 3 ng/m ³	70% 14 ng/m ³	Not specified
Lower assessment threshold in percent of the target value	50% 0.25 µg/m ³	40% 2.4 ng/m ³	40% 2 ng/m ³	50% 10 ng/m ³	Not specified

3 Road Traffic Sources

3.1 Narrow Congested Streets with Residential Properties Close to the Kerb

Since the last round of review and assessment North Lincolnshire Council has not identified any new narrow and congested streets with residential properties close to the kerb. No streets were identified during the last round of review and assessment and as such North Lincolnshire does not have any roads which meet the criteria set out in TG (09). The locations of the roads covered in this section can be found in Appendix B of this report.

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

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

North Lincolnshire Council has not identified any new streets where people may spend more than 1 hour close to traffic. In 2006 a number of streets were identified as potentially fitting the criteria stated in TG (09). The relevant locations and concentrations in 2008 for those investigated in 2006 are stated below.

Table 3.1a DMRB Results - Busy Streets Where People May Spend 1-hour or More Close to Traffic

Location & Receptor	2008 PM ₁₀ Projected Annual Concentration	2008 PM ₁₀ Projected Daily Exceedances	2008 NO ₂ Projected Annual Concentration
Ashby Rd (489188, 408908)	19.83	3.19	22.48
Howdens Hill (489243, 410665)	22.72	7.58	36.77
Queensway (489209, 409945)	20.42	3.93	25.42
Scawby Rd (496651, 406724)	19.36	2.67	26.28
Barnard Avenue (500323, 507220)	25.58	13.83	21.41
Ashby Rd (489182, 410137)	22.51	7.19	35.98
Bridge Street (499642, 407097)	21.59	5.64	25.02
Grange Lane South (490326, 408003)	21.30	5.19	26.12
Glebe Rd (489506, 411740)	20.44	3.96	25.62
Frodingham Road (489048, 412127)	21.10	4.89	23.03
Wrawby Road (501830, 508530)	24.90	12.17	19.78
Ashby High Street (489343, 408645)	19.16	2.45	20.91

North Lincolnshire Council - Draft

None of the locations highlighted in 2006 breached Air Quality Objectives in 2008 for both NO₂ and PM₁₀. As no new locations have been identified North Lincolnshire Council does not need to proceed to a detailed assessment for streets in which people spend an hour or more within 5m of the kerb.

North Lincolnshire Council confirms that there are no new/newly identified busy streets where people may spend 1 hour or more close to traffic.

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

No new roads with high flows of Buses or HGVs have been identified since the last round of review assessment. Humber Road, South Killingholme was the only location to be identified during the last round of review and assessment. Other roads within North Lincolnshire have been identified as having a high concentration of HDVs but do not have relevant exposure within 10m of the kerb as stated in the TG (09). The figures for 2008 for Humber Road are shown below.

Table 3.2a DMRB Results - Roads with a High Flow of Buses and/or HGVs.

Location & Receptor	2008 PM ₁₀ Projected Annual Concentration	2008 PM ₁₀ Projected Daily Exceedances	2008 NO ₂ Projected Annual Concentration
Humber Road (A160) (515278, 516079)	21.55	5.57	31.33

PM₁₀ & NO₂ concentrations are both below Air Quality Objectives. As no further locations with high flows of HDVs have been identified North Lincolnshire Council does not need to proceed to a detailed assessment.

North Lincolnshire Council confirms that there are no new/newly identified roads with high flows of buses/HDVs.

3.4 Junctions

North Lincolnshire Council has not identified any new junctions that exceed the thresholds stated in TG (09). A number of junctions were previously highlighted in previous rounds of review and assessment. These junctions remain above the thresholds set in TG (09) for location of receptors and volume of traffic. These junctions have been assessed using the DMRB screening model to ensure their compliance with relevant air quality objectives.

Table 3.3a DMRB Results - Junctions

Location & Receptor	2008 PM₁₀ Projected Annual Concentration	2008 PM₁₀ Projected Daily Exceedances	2008 NO₂ Projected Annual Concentration
Britannia Corner (489189, 411333)	21.26	5.12	27.34
Ashby Rd / West Common Lane (489073, 409557)	20.14	3.57	23.92
Brigg Monument (500405, 507203)	25.09	12.62	20.20
Messingham Rd / Burringham Rd (489245, 408646)	19.30	2.59	20.98
Ferriby Rd / Holydyke (502851, 522043)	18.94	2.22	21.67
Ashby High St / Ashby Rd (489054, 408628)	25.11	12.66	20.27
Barnard Ave / Cary Lane (499925, 407429)	19.61	2.94	20.45
Messingham Rd / Chancel Rd (489103, 407751)	20.19	3.64	22.43
Barrow Rd / Whitecross St (503295, 521787)	18.81	2.10	20.73

All relevant junctions do not exceed any Air Quality Objectives for NO₂ and PM₁₀. North Lincolnshire Council does not need to proceed to a detailed assessment for junctions at this time.

North Lincolnshire Council confirms that there are no new/newly identified busy junctions/busy roads.

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

A number of new roads have been constructed since the last round of review and assessment although none of the locations exceed the thresholds stated in TG (09). The roads investigated included;

- Wisteria Way, Bottesford, Scunthorpe
- Wilkinson Way, Bottesford, Scunthorpe
- Pinewood Close, Bottesford, Scunthorpe

North Lincolnshire Council does not need to proceed to a Detailed Assessment for newly constructed roads.

North Lincolnshire Council has assessed new/newly-identified junctions meeting the criteria in Section A.5 of Box 5.3 in TG (09), and concluded that it will not be necessary to proceed to a Detailed Assessment.

3.6 Roads with Significantly Changed Traffic Flows

No roads within North Lincolnshire have seen significant changes to their traffic flows. The Wisteria Way Development has added to the numbers of traffic flowing through the Ashby Ville Roundabout but not such that the AADT exceeds any of the relevant thresholds. This is backed up by the compliant readings currently being taken at this roundabout with Nitrogen Dioxide Diffusion Tubes. North Lincolnshire Council does not need to proceed to a detailed assessment at this time.

North Lincolnshire Council confirms that there are no new/newly-identified roads with significantly changed traffic flows.

3.7 Bus and Coach Stations

There are no relevant bus stations within North Lincolnshire with more than 2500 bus movements per day. The largest bus station within North Lincolnshire is the Scunthorpe Bus Station, which has at most 450 bus movements per day and no relevant receptors within 10m of the station. The location of this Bus Station can be found in Appendix F of this report.

North Lincolnshire Council does not need to proceed to a detailed assessment at this time for Bus & Coach Stations

North Lincolnshire Council confirms that there are no relevant bus stations in the Local Authority area.

4 Other Transport Sources

4.1 Airports

North Lincolnshire Council has only one Airport operating within its boundary, Humberside International Airport. Another airport lies close to the boundary of North Lincolnshire, Robin Hood Airport, located within the boundary of Doncaster Metropolitan Borough Council.

Both airports have been assessed using the criteria stated in TG (09). Humberside International Airport does have relevant receptors within 1000m of its boundary but does not exceed the thresholds for the throughput of passengers and freight.

Robin Hood International Airport also has relevant receptors within 1000m of its boundary but again falls short of the thresholds for passengers and freight throughput.

The location of Humberside Airport and the receptors located within a 1km radius can be found in Appendix G of this report.

Table 4.1a Airport Information

Airport	Movements	Passengers	Freight (t)	MPPA
Humberside	13157	670894	652	0.67
Robin Hood (Doncaster)	7310	899307	161	0.89

Neither Airport has a background concentration of greater than 25 ug/m³ removing the need for North Lincolnshire Council to progress to a detailed assessment for Airports at this time.

North Lincolnshire Council confirms that there are no relevant airports in the Local Authority area.

4.2 Railways (Diesel and Steam Trains)

4.2.1 Stationary Trains

During the last round of review and assessment it was confirmed that there were no incidences where any passenger or freight rail traffic would be stationary for periods of 15 minutes or more with engines running. Consequently there would be no occurrences of rail traffic giving rise to significant relevant exposure within North Lincolnshire and eliminate the need to proceed to a detailed assessment for Sulphur Dioxide

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

4.2.2 Moving Trains

North Lincolnshire does not contain any stretches of track considered busy with high numbers of diesel locomotives and will therefore not be required to continue to a Detailed Assessment for Nitrogen Dioxide.

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

4.3 Ports (Shipping)

There are two shipping terminals within North Lincolnshire, which have the capacity for the acceptance of large ships (i.e. container ships, roll-on/roll-off ships etc).

- Humber International Terminal (NGR: 518910 / 416610)
- North Killingholme Haven (NGR: 516536 / 420012)

Using GIS, no relevant exposure was identified within 1km of either of the terminals. Hull and Goole Port Health Authority regulate Humber International Terminal and North Killingholme Haven along with other operations at Guinness Wharf, Grove Wharf and New Holland Bulk Services. The results of this investigation including receptors within a 1km radius can be found within Appendix H of this report. North Lincolnshire Council is therefore not required to proceed to a detailed assessment for shipping at this time.

North Lincolnshire Council confirms that there are no ports or shipping that meet the specified criteria within the Local Authority area.

5 Industrial Sources

5.1 Industrial Installations

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

North Lincolnshire Council has received a number of applications from proposed installations since the last round of review and assessment.

Planning permission has been granted to erect a glass wool insulation product manufacturing plant on land situated at North Killingholme. The site will be issued with a permit regulated by the Environment Agency as required by the Environmental Permitting Regulations.

A comprehensive report was submitted suggesting appropriate stack heights and highlighted the impact of emissions on local air quality. The report predicted that the air quality objectives would continue to be met and was not opposed on the grounds it would have a negative impact on Air Quality.

Singleton Birch in Melton Ross, North Lincolnshire have been granted planning permission to erect a Biomass Energy Generation Facility at their existing Lime Production Plant. The site will be subject to regulation under Pollution, Prevention and Control (PPC) legislation and will be required to meet emission limits as set out in the Waste Incineration Directive (WID). The area concerned does not currently fall within any Air Quality Management Areas.

Modelling results in the air quality assessment show that there will be no significant impacts on air quality either from the operation of the plant or from any increase in tailpipe emissions as a result of additional road traffic. Modelling carried out suggests that the plant will have a 'slight adverse' impact on short-term NO₂, SO₂ and vanadium concentrations in the area, although it is predicted that concentrations will remain within the appropriate objectives.

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

North Lincolnshire Council - Draft

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

A number of Industrial installations were identified during the last round of review and assessment within North Lincolnshire. Such industrial installations have been screened to ensure that their emissions have not substantially increased, defined as an increase of greater than 30%, giving rise to pollutant levels and potential exceedances of Air Quality Objectives. All data has been acquired direct from the Environment Agencies Pollution Inventory.

Table 5.1a 1,3 Butadiene (tonnes per annum)

Installation	2006	2007	2008	% Change
Total Lindsey Oil Refinery	11	11	12	8
Conoco Phillips	12	12	12	0

The two installations likely to emit benzene have not seen a substantial increase in emissions and will not require further investigation.

Table 5.1b Benzene (tonnes per annum)

Installation	2006	2007	2008	% Change
Corus UK Ltd	33.3	34.4	33.2	-0.3
Koppers UK Ltd	189.2	174.4	152.8	-23.82
National Grid Gas Plc	BRT *	BRT *	BRT *	-
Cemex	BRT *	1067 *	BRT *	-
Fibrogen Ltd	BRT *	BRT *	BRT *	-
Total Lindsey Oil Refinery	117	122	126	7.1
Conoco Phillips	306	297	302	-1.3

*** BRT denotes below recordable threshold**

All existing installations assessed for the emission of Benzene saw a reduction with the exception of the Total Lindsey Oil Refinery, which saw an increase of 7.1%, within the thresholds set by TG (09) and not requiring any further investigation

North Lincolnshire Council - Draft

Table 5.1c Carbon Monoxide (tonnes per annum)

Installation	2006	2007	2008	% Change
Corus UK Ltd	120	118	112	-7.5
Centrica Brigg Ltd	BRT	BRT	BRT	-
National Grid Gas Plc	BRT	BRT	BRT	-
Cemex	634	709	647	2.1
Europa Oil & Gas	BRT	BRT	BRT	-
Keadby Power	726	-	-	-
Singleton Birch	BRT	BRT	BRT	-
Fibrogen Ltd	BRT	BRT	BRT	-
Total Lindsey Oil Refinery	BRT	BRT	BRT	-
Conoco	440	404	408	-7.8
E.ON	511	504	605	15.5
Immingham CHP	201	300	267	24.7
Centrica KPS	BRT	196	463	-

Many of the installations have reported numbers below the recordable threshold. Of the installations that reported figures only the Killingholme Power Stations reported increases in Carbon Monoxide emissions. Neither installation saw a substantial increase and will therefore not be subject to further investigation.

Table 5.1d Lead (tonnes per annum)

Installation	2006	2007	2008	% Change
Corus UK Ltd	12.2	12.1	11.4	-7.1
Centrica Brigg Ltd	BRT	BRT	BRT	-
National Grid Gas Plc	BRT	BRT	BRT	-
Cemex	BRT	BRT	BRT	-
Total Lindsey Oil Refinery	BRT	BRT	BRT	-
Conoco	BRT	BRT	BRT	-
Immingham CHP	BRT	BRT	BRT	-

North Lincolnshire Council - Draft

No existing installation saw an increase in emissions with only Corus UK reporting numbers above reportable thresholds. No further investigations are required.

Table 5.1e Nitrogen Dioxide (tonnes per annum)

Installation	2006	2007	2008	% Change
Corus UK Ltd	6462	6530	6110	-6
Koppers UK Ltd	BRT	BRT	BRT	-
Centrica Brigg Ltd	315	487	591	47
National Grid Gas Plc	BRT	BRT	BRT	-
Cemex	1763	1376	895	-97
Europa Oil & Gas	BRT	BRT	BRT	-
Keadby Power	726	-	-	-
Caparo Merchant Bar	BRT	BRT	BRT	-
Singleton Birch	BRT	BRT	BRT	-
Fibrogen Ltd	BRT	BRT	BRT	-
Total Lindsey Oil Refinery	1672	1856	1905	12
Conoco	2707	2766	2723	1
E.ON	-	1938	2391	-
Immingham CHP	1105	1091	1097	-1
Centrica KPS	776	1168	2388	68

Of the installations assessed two sites reported substantially increased emissions. The Centrica Killingholme Power Station and the Centrica Brigg Power Station. Both Power Stations have been subject to increased demand and as such their increased emissions are a result of market conditions and the plants increased output. There have been no process changes or incidents that would lead to the higher emission rates and as such these emissions are unavoidable with the individual sites current abatement.

Both sites have been assessed using the nomograms in TG (09) and neither exceeds the permitted emission rates that would lead to a ground level exceedance of the relevant air quality objective. North Lincolnshire Council is therefore not required to proceed to a detailed assessment at this time.

North Lincolnshire Council - Draft

Table 5.1f PM₁₀ (tonnes per annum)

Installation	2006	2007	2008	% Change
Corus UK Ltd	2146	2721	3170	32.3
Centrica Brigg Ltd	BRT	BRT	BRT	-
National Grid Gas Plc	BRT	BRT	BRT	-
Cemex	122	114	78	-56.4
Keadby Power	31	-	-	-
Singleton Birch	50	44	78	36.1
Fibrogen Ltd	BRT	BRT	BRT	-
Total Lindsey Oil Refinery	169	148	158	-6.9
Conoco	182	187	208	12.5
E.ON	-	28	37	-
Immingham CHP	BRT	BRT	BRT	-

Two installations assessed reported substantially increased emissions. Corus UK Ltd and Singleton Birch Ltd. Corus UK is a large steel plant believed to be contributing to the Air Quality Objective breaches at Santon leading to the 2008 Low Santon AQMA for Annual Mean and the 2006 Scunthorpe wide AQMA for breaches of the Daily Mean Objective.

Corus have explained that there has been a change in how it calculates its PM₁₀ figure due to the inconsistencies of solely relying on an extractive test. Much of the increase can be put down to a higher steel output over the past few years. As Corus has already been assessed and a further assessment will be submitted to DEFRA in December 2009 no further investigations need to be carried out at this time.

Singleton Birch is a lime manufacturing plant located at Melton Ross, North Lincolnshire. The plant saw its PM₁₀ emission increase by 36% between 2006 and 2008. The nomograms published within the TG (09) have been used to determine whether ground level exceedances of any Air Quality Objectives are likely to occur. A calculation has been carried out for each stack likely to emit PM₁₀ from Singleton Birch. No stack exceeds the thresholds necessary to undertake a detailed assessment and remain unlikely to create a ground level exceedance within the area.

North Lincolnshire Council - Draft

Table 5.1g Sulphur Dioxide

Installation	2006	2007	2008	% Change
Corus UK Ltd	9220	8453	9200	-0.2
Koppers UK Ltd	BRT	BRT	BRT	-
Centrica Brigg Ltd	BRT	BRT	BRT	-
National Grid Gas Plc	BRT	BRT	BRT	-
Cemex	1535	1651	1112	-38.1
Keadby Power	BRT	BRT	BRT	-
Caparo Merchant Bar	BRT	BRT	BRT	-
Singleton Birch	BRT	BRT	BRT	-
Fibrogen Ltd	BRT	BRT	BRT	-
Total Lindsey Oil Refinery	10962	9200	9326	-17.5
Conoco	6292	6516	5089	-23.6
E.ON	BRT	BRT	BRT	-
Immingham CHP	BRT	BRT	BRT	-
Centrica KPS	BRT	BRT	BRT	-

All installations reporting numbers above the recordable threshold showed reductions in their Sulphur Dioxide emissions. No further investigations will be required at this time.

North Lincolnshire Council has assessed industrial installations with substantially increased emission and concluded that it will not be necessary to proceed to a Detailed Assessment.

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

North Lincolnshire has not identified any new or significantly changed installations with no previous air quality assessment.

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

5.2 Major Fuel (Petrol) Storage Depots

North Lincolnshire Council has not identified any new Major Fuel Storage Depots. In previous rounds of review and assessment the following have all been investigated.

- Conoco Philips (UK) Ltd, Killingholme
- Total UK Ltd Oil Refinery, Killingholme
- Total UK Ltd Oil Road – Loading Terminal, Killingholme

The mass emission of Benzene for the Conoco Philips and Total UK refineries have been considered within the industrial emission section of this report and have shown no exceedances. The sites have shown no exceedances within previous rounds of review and assessment.

There are major fuel (petrol) storage depots within the Local Authority area, but these have been considered in previous reports.

5.3 Petrol Stations

North Lincolnshire Council has no petrol stations that meet the criteria requiring assessment stated in Technical Guidance (09).

North Lincolnshire Council confirms that there are no petrol stations meeting the specified criteria.

5.4 Poultry Farms

A number of Poultry Farms are present within North Lincolnshire. 28 farms currently hold permits with the Environment Agency. None of the farms assessed house birds greater than;

- 400,000 birds if mechanically ventilated
- 200,000 birds if naturally ventilated
- 100,000 birds for any turkey unit

As none of these criteria are met stated in TG (09) North Lincolnshire Council will not need to proceed to a detailed assessment.

North Lincolnshire Council confirms that there are no poultry farms meeting the specified criteria.

6 Commercial and Domestic Sources

6.1 Biomass Combustion – Individual Installations

There is currently only one Biomass Installation operating within North Lincolnshire with a generation capacity of between 50kW to 20MW. Fibrogen UK operates within the Flixborough Industrial Estate area of North Lincolnshire. Its fuel source consists of MBM (Meat & Bone Meal) and has a generation capacity of 13.5MW.

This source has been assessed and checked against the relevant criteria as set out in Technical Guidance 2009. The stack heights and emission rates have been checked against the relevant nomograms and have not exceeded the permitted levels, which would result in a ground level exceedance.

Therefore the Fibrogen plant will not be subject to a Detailed Assessment.

North Lincolnshire Council has assessed the biomass combustion plant, and concluded that it will not be necessary to proceed to a Detailed Assessment.

6.2 Biomass Combustion – Combined Impacts

Following guidance given by the LAQM helpdesk and the lack of information on the numbers of small biomass boilers within North Lincolnshire the FAQ produced for the Air Quality Archive Website has been followed.

Using the nomograms produced to highlight potential exceedances of relevant PM_{10} objectives an area of dense population was selected within North Lincolnshire. The 500m x 500m square selected was 489500, 411500 which incorporates the housing estates of Crosby and Frodingham. The background concentration of PM_{10} at this concentration is projected to be $27.7\mu\text{g}/\text{m}^3$ in 2010. Using figure 5.22 in TG (09) a background concentration of this order would require around 80 dwellings to be burning wood in a fireplace as their principle source of heat.

North Lincolnshire Council considers this extremely unlikely and combined with a TEOM placed within this grid square showing no exceedances of the objective a detailed assessment will not be required at this time.

North Lincolnshire Council has assessed the biomass combustion plant, and concluded that it will not be necessary to proceed to a Detailed Assessment.

6.3 Domestic Solid-Fuel Burning

The village of Keadby was identified in the 2003 Updating and Screening Assessment as an area with a significant level of domestic coal burning. During the 2003 USA a residential survey was conducted on this area to assess the extent of domestic coal burning, the results of which lead to a detailed assessment of Sulphur Dioxide at this location.

An automatic monitoring station was installed at Station Road, Keadby from the 12th January 2004 to the 15th February 2005 to monitor the levels of Sulphur Dioxide within the area. . After reviewing the information recorded by this monitoring station the Air Quality Progress report was submitted for 2005 where it was concluded that there was no need to declare an Air Quality Management Area.

As domestic coal burning within Keadby was covered in previous reports and as there has been no other areas identified since these reports North Lincolnshire Council will not need to proceed to a detailed assessment of Sulphur Dioxide.

North Lincolnshire Council has assessed areas of significant domestic solid fuel use, and concluded that it will not be necessary to proceed to a Detailed Assessment.

7 Fugitive or Uncontrolled Sources

All potential sources of significant fugitive dust emissions from processes such as Quarrying, Land filling, Coal and Material Stockyards, Major Construction Works and Waste Management Sites were identified in previous rounds of Review and Assessment. No new installations likely to give rise to fugitive emissions have been identified.

Sites identified in previous rounds of review and assessment have not seen significant changes to throughput, receptor locations etc. and none have been the origins of local complaints. North Lincolnshire Council will not need to proceed to a Detailed Assessment at this time for fugitive or uncontrolled sources.

North Lincolnshire Council confirms that there are no potential sources of fugitive particulate matter emissions in the Local Authority area.

8 Conclusions and Proposed Actions

8.1 Conclusions from New Monitoring Data

New monitoring data has not highlighted any new exceedances since the last round of review and assessment. Results and locations showing exceedances since the last round of review and assessment have all been subject to further assessments. At present locations highlighted as being non compliant include;

- Low Santon – Annual Mean and Daily Exceedances
- East Common Lane – Daily Exceedances

East Common Lane and Santon currently sit within the 2005 Scunthorpe AQMA for breaches of the daily objective. A number of other monitoring stations lie within this AQMA, which remain compliant with objectives. The continuing issues at Santon and East Common Lane are currently being addressed using the measures put in place by the current Action Plan due to be reviewed in 2009.

Low Santon is also subject to breaches of the Annual Mean Objective. This resulted in the declaration of the 2008 Low Santon AQMA for the breach of the Annual Mean PM₁₀ concentration. As this was identified in previous rounds of review and assessment the Detailed Assessment is due to be submitted to DEFRA in December 2009.

8.2 Conclusions from Assessment of Sources

Since the last round of review and assessment no new sources have been identified as breaching the thresholds required to proceed to a detailed assessment. The following sources were all checked against the relevant criteria as stated in the Technical Guidance 2009;

- Road Traffic
- Bus & Coach Stations
- Airports
- Railway Lines
- Ports
- Industrial Installations
- Major Fuel Storage Depots
- Petrol Stations
- Poultry Farms
- Biomass Installations
- Fugitive Sources

Of the sources checked only a handful of Industrial Sources reported substantial increases in the emission of relevant pollutants. These were all checked using the Technical Guidance 2009 nomograms leading to the decision that all of the increases would not give rise to ground level concentrations and consequently not exceed any of the relevant Air Quality Objectives.

Corus was the exception to this rule highlighting a substantial increase in the levels of PM₁₀ emitted. As the Integrated Steel Works is in the centre of the 2005 AQMA and adjacent to the boundary of the 2008 AQMA North Lincolnshire Council thought it was not necessary to proceed to a Detailed Assessment. Current work to identify the predominant sources on the Integrated Steel Works site include a source apportionment study, a joint venture with the Environment Agency and continuous PM_{2.5} monitoring designed to help identify problem plants. The Further Assessment due to be submitted as a requirement of the 2008 Low Santon AQMA declaration is due to be submitted to DEFRA in December 2009.

All of the sources, which were checked in accordance with the Technical Guidance 2009, have not resulted in a requirement for North Lincolnshire Council to proceed to any Detailed Assessments.

8.3 Proposed Actions

The 2009 Updating and Screening Assessment has not identified any new locations required to be the subject of a Detailed Assessment.

Breaches of Air Quality Objectives for PM₁₀ continue within existing AQMAs although the boundary of the 2005 AQMA will be in association with a review of monitoring strategy.

The next rounds of review and assessment will be as follows;

- Action Plan Review 2009
- Further Assessment Low Santon December 2009
- Progress Report 2010

The Air Quality Objective breaches at Santon and within the Scunthorpe Town AQMA will continue to be monitored. Measures currently put in place will continue to be followed along with close working links with the Environment Agency to reduce the effects heavy industry is having on the air quality of North Lincolnshire.

9 References

Technical Guidance (February 2009), DEFRA
Particulate Matter within the United Kingdom (2005), Air Quality Expert Group
Updating and Screening Assessment (2003), North Lincolnshire Council
Detailed Assessment of Benzene, Sulphur Dioxide & PM10 (2004), North Lincolnshire Council
Detailed Assessment of Benzene (2005), North Lincolnshire Council
Progress Report (2005), North Lincolnshire Council
Updating and Screening Assessment (2006), North Lincolnshire Council
Detailed Assessment of PM10 (2008), North Lincolnshire Council
Further Assessment of PM10 (2008), North Lincolnshire Council
Progress Report (2008), North Lincolnshire Council

<http://www.nlincsair.info/>

<http://maps.environment-agency.gov.uk/wiyby>

<http://www.airquality.co.uk/laqm>

<http://www.uwe.ac.uk/aqm>

Appendices

Appendix A: QA/QC Data

Appendix B: DMRB Calculations & Road Locations

Appendix C: Locations of Monitoring Stations

Appendix D: Diffusion Tubes

Appendix E: Current AQMAs

Appendix F: Bus Stations

Appendix G: Airports

Appendix H: Ports

Appendix I: NOX to NO2 Calculator

Appendix J: Bias Calculation Adjustments

Appendix A: QA:QC Data

Diffusion Tube Bias Adjustment Factors

North Lincolnshire Council currently uses South Yorkshire Laboratories for both supply and analysis of its Nitrogen Dioxide Diffusion Tubes. The Bias Adjustment factor from all Local Authorities for 2008 is 0.96.

Factor from Local Co-location Studies (if available)

North Lincolnshire currently has 3 ongoing co located studies as discussed in the monitoring data section of this report. Sites include; Scunthorpe Town and urban industrial site, Kingsway House an urban roadside location and Gallagher Retail Park a roadside location. The bias and annual means for each site was as follows

Site	Analyser Annual Mean	Tube Annual Means	Bias Adjustment Factor
Scunthorpe Town	18.75	26.11	0.72
Kingsway House	31.24	34.02	0.92
Gallagher Retail Park	27.94	27.14	1.01

Discussion of Choice of Factor to Use

The decision to use a Bias Adjustment Factor generated from our own co location study was reached due to the complexity of the issues within North Lincolnshire. As the AQMA's declared within North Lincolnshire are predominantly industry related it was felt that using an average of other authority figures would be unsuitable. As we understand all Authorities using South Yorkshire Laboratories have declared AQMA's as a result of traffic related problems.

Our urban industrial site presented an adjustment factor that would have halved our results. Discussions with the LAQM helpdesk led us to reject this figure and to select a co location study that was more representative of the tubes in situ. A more relevant study in Kingsway House due to it's urban roadside location and has been used as the study of choice.

Although the tube network is spread over a wide area of North Lincolnshire the tubes are situated in relatively similar situations, all at the same height and if the tubes are not co located most are held on lamppost roadside sites. This study has been ongoing since 2006 and has presented different adjustment factors each year. We have confidence within our continuous monitor at this location due to its strict calibration programme and ratification procedures carried out by AEA. Details of the Bias Adjustment used can be found within Appendix J of this report.

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PM Monitoring Adjustment

Particulate matter within North Lincolnshire is currently measured using TEOM. The sites at Santon and Scunthorpe Town have co located Partisols as discussed in the monitoring data section of this report. Numbers reported with results from a TEOM have had a factor of 1.3 applied and then corrected using the Volatile Correction Model as recommended by the Technical Guidance 2009.

Short-term to Long-term Data adjustment

As all sites assessed during this Updating & Screening Assessment are long-term studies it has not been necessary to adjust any data from short term to long-term numbers.

QA/QC of automatic monitoring

AEA Technology currently carry out the QA/QC amendments to our data via their Calibration Club service. Each of the gas analysers is calibrated every 2 weeks with the TEOMs calibrated fortnightly and filter changed every 4 weeks.

QA/QC of diffusion tube monitoring

South Yorkshire Laboratories have demonstrated satisfactory performance in the WASP scheme for analysis of NO₂ diffusion tubes, between January 2008 and January 2009.

Laboratory	Performance on basis of RPI, OLD CRITERIA, best 4 out of the 5 rounds 100-104	Performance on basis of RPI, NEW CRITERIA, best 4 out of the 5 rounds 100-104
Aberdeen Public Analysts	Good	Good
Bodycote Clyde Analytical	Acceptable	Acceptable
Bristol City Council	Good	Good
Bureau Veritas	Good	Acceptable
Cardiff Scientific Services	Good	Good
Dundee City Council (Tayside)	Good	Acceptable
Edinburgh City Council	Good	Good
Glasgow Scientific Services	Good	Good
Gradko	Good	Good
Harwell Scientifics	Good	Good
Kent Scientific Services	Good	Good
Kirklees MBC	Good	Acceptable
Lambeth Scientific Services	Good	Good
Lancashire County Analysts	Good	Acceptable
Milton Keynes Council	Good	Acceptable
Northampton Borough Council	Good	Good
South Yorkshire Laboratories	Good	Good
Staffordshire County Council	Good	Good
University of Essex	Good	Acceptable
Walsall MBC	Acceptable	Acceptable
West Yorks Analytical Services	Good	Good

Appendix B: DMRB Calculations

Results - Busy streets where people spend more than 1 hour close to traffic

Location/ Receptor	Name	Year	Total NO _x ¹	Rd NO _x ²	Adj Rd NO _x ³	Adj Total NO _x ⁴	Adj Rd NO ₂ ⁵	Adj Total NO ₂ ⁶	PM ₁₀	
			Annual mean µg/m ³	Annual mean µg/m ³	Annual mean µg/m ³	Annual mean µg/m ³	Annual mean µg/m ³	Annual mean µg/m ³	Annual mean µg/m ³	Annual mean µg/m ³
1	Ashby Road	2008	42.7	20.9	20.9	42.7	9.17	26.27	22.7	8
2	Howdens Hill	2008	69.5	33.6	33.6	69.5	13.35	36.85	30.1	28
3	Queensway	2008	55.3	20.6	20.6	55.3	8.63	31.63	28.2	21
4	Scawby Road	2008	29.8	10.8	10.8	29.8	4.96	20.76	21.5	6
5	Barnard Avenue	2008	42.2	23.7	23.7	42.2	10.41	26.01	28.5	22
6	Ashby Road	2008	61.0	25.1	25.1	61.0	10.29	33.79	29.2	25
7	Bridge Street	2008	46.0	25.3	25.3	46.0	10.96	27.56	27	18
8	Grange Lane	2008	44.1	21.4	21.4	44.1	9.34	26.84	23.4	9
9	Glebe Road	2008	51.5	16.4	16.4	51.5	6.96	30.16	27.5	27
10	Frodingham Rd	2008	38.8	17	17	38.8	7.56	24.60	23.6	9
11	Wrawby Road	2008	34.6	16.4	16.4	34.6	7.4	22.9	25.6	14
12	Ashby High St	2008	36.3	14.5	14.5	36.3	6.51	23.61	21.8	6

¹ Total NO_x = direct from DMRB local output sheet

² Rd NO_x = Total NO_x – Background NO_x

³ Adj Rd NO_x = Rd NO_x x verification factor (state verification factor used)

⁴ Adj Total NO_x = Adj Rd NO_x + Background NO_x

⁵ Adj Rd NO₂ = from NO_x to NO₂ calculator (available LAQM Tools)

⁶ Adj Total NO₂ = Adj Rd NO₂ + Background NO₂

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Results - Junctions

Location/ Receptor	Name	Year	Total NO _x ¹	Rd NO _x ²	Adj Rd NO _x ³	Adj Total NO _x ⁴	Adj Rd NO ₂ ⁵	Adj Total NO ₂ ⁶	PM ₁₀	
			Annual mean µg/m ³	Annual mean µg/m ³	Annual mean µg/m ³	Annual mean µg/m ³	Annual mean µg/m ³	Annual mean µg/m ³	Annual mean µg/m ³	Annual mean µg/m ³
13	Brittania Corner	2008	49.8	24.7	24.7	49.8	10.71	33.37	30.8	31
14	Ashby Road / West Common Lane	2008	42.0	17.3	17.3	42.0	7.33	30.32	28.2	21
15	Brigg Monument	2008	36.6	18.1	18.1	36.6	8.11	23.71	27.7	20
16	Messingham Rd/ Burringham Rd	2008	34.4	12.6	12.6	34.4	5.69	22.79	21.7	6
17	Ferriby Road / Holydyke	2008	33.9	15.8	15.8	33.9	7.15	22.53	19.2	2
18	Barnard Ave / Cary Lane	2008	38.4	17.7	17.7	38.4	7.88	24.48	26.1	15
19	Messingham Rd / Chancel Road	2008	35.1	12.6	12.6	35.1	5.69	22.89	21.1	5
20	Ashby High St / Ashby Rd	2008	42.8	21	21	42.8	9.21	26.31	22.6	7
21	Barrow Rd / White Cross St	2008	35.6	14.6	14.6	35.6	6.38	26.88	24.5	11

¹ Total NO_x = direct from DMRB local output sheet

² Rd NO_x = Total NO_x – Background NO_x

³ Adj Rd NO_x = Rd NO_x x verification factor (state verification factor used)

⁴ Adj Total NO_x = Adj Rd NO_x + Background NO_x

⁵ Adj Rd NO₂ = from NO_x to NO₂ calculator (available LAQM Tools)

⁶ Adj Total NO₂ = Adj Rd NO₂ + Background NO₂

Results – Roads with a high concentration of HGVs

Location/ Receptor	Name	Year	Total NO _x ¹	Rd NO _x ²	Adj Rd NO _x ³	Adj Total NO _x ⁴	Adj Rd NO ₂ ⁵	Adj Total NO ₂ ⁶	PM ₁₀	
			Annual mean µg/m ³	Annual mean µg/m ³	Annual mean µg/m ³	Annual mean µg/m ³	Annual mean µg/m ³	Annual mean µg/m ³	Annual mean µg/m ³	Annual mean µg/m ³
22	Humber Road	2008	72.8	57.1	57.1	72.8	22.8	35.1	21.7	6

¹ Total NO_x = direct from DMRB local output sheet

² Rd NO_x = Total NO_x – Background NO_x

³ Adj Rd NO_x = Rd NO_x x verification factor (state verification factor used)

⁴ Adj Total NO_x = Adj Rd NO_x + Background NO_x

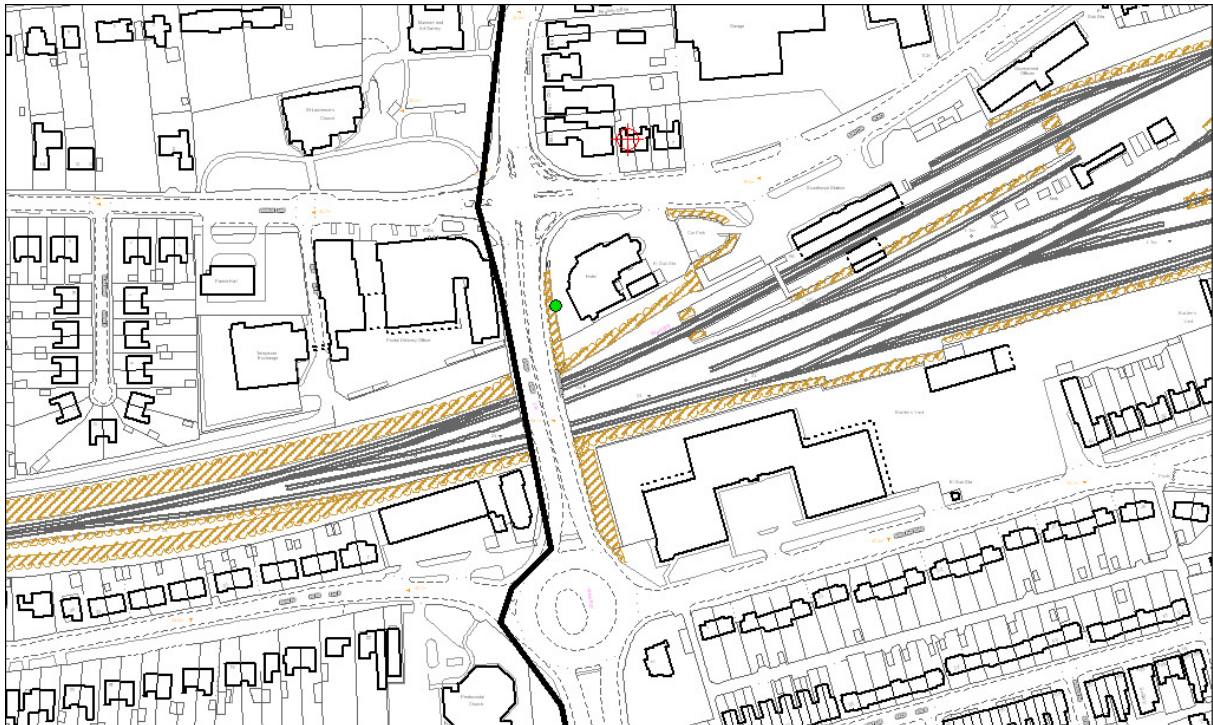
⁵ Adj Rd NO₂ = from NO_x to NO₂ calculator (available LAQM Tools)

⁶ Adj Total NO₂ = Adj Rd NO₂ + Background NO₂

Maps of Locations



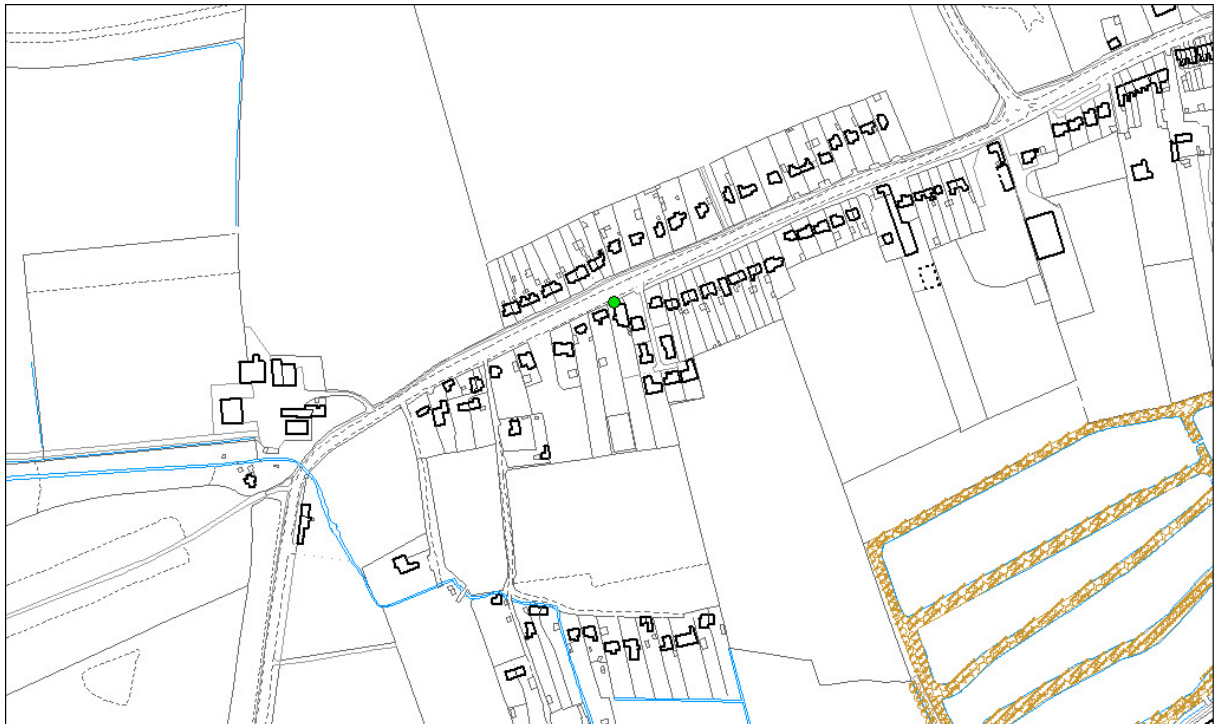
1. Busy streets where people spend more than 1 hour close to traffic – Ashby Road (Priory)



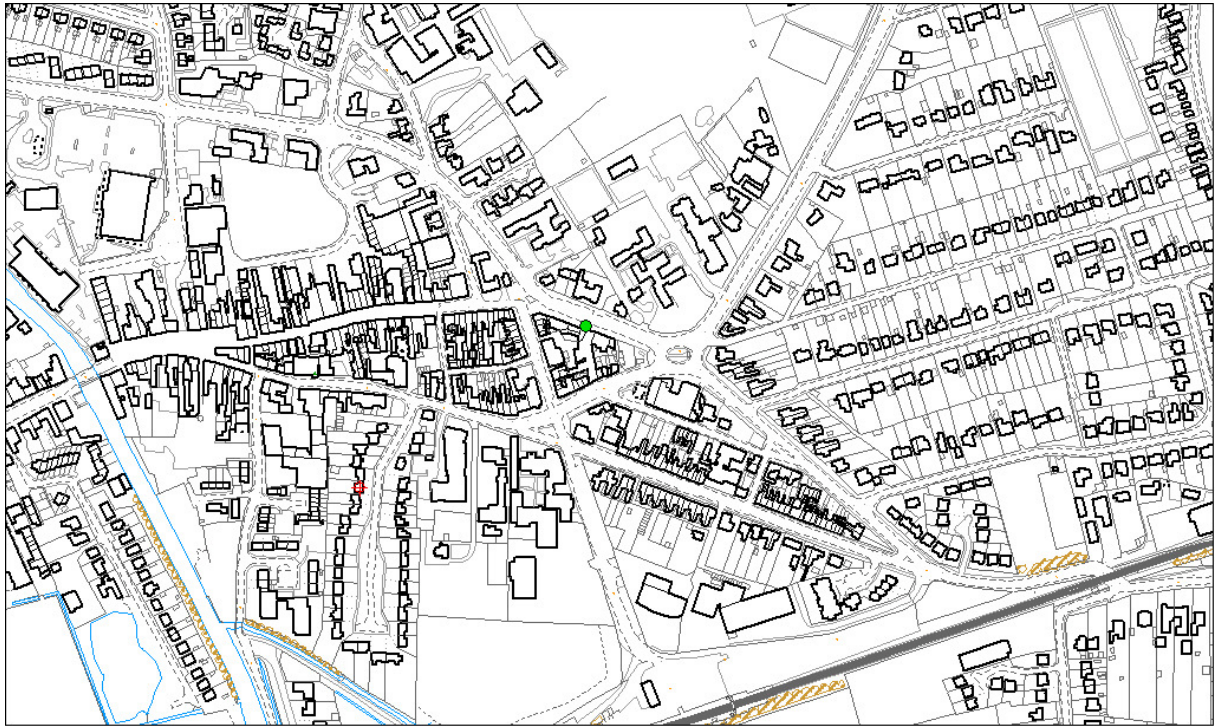
2. Busy streets where people spend more than 1 hour close to traffic – Howdens Hill



3. Busy streets where people spend more than 1 hour close to traffic - Queensway



4. Busy streets where people spend more than 1 hour close to traffic – Scawby Rd



5. Busy streets where people spend more than 1 hour close to traffic – Barnard Avenue



6. Busy streets where people spend more than 1 hour close to traffic – Ashby Road (Central Park)

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7. Busy streets where people spend more than 1 hour close to traffic – Bridge Street



8. Busy streets where people spend more than 1 hour close to traffic – Grange Lane South

North Lincolnshire Council - England



11. Busy streets where people spend more than 1 hour close to traffic – Wrawby Road



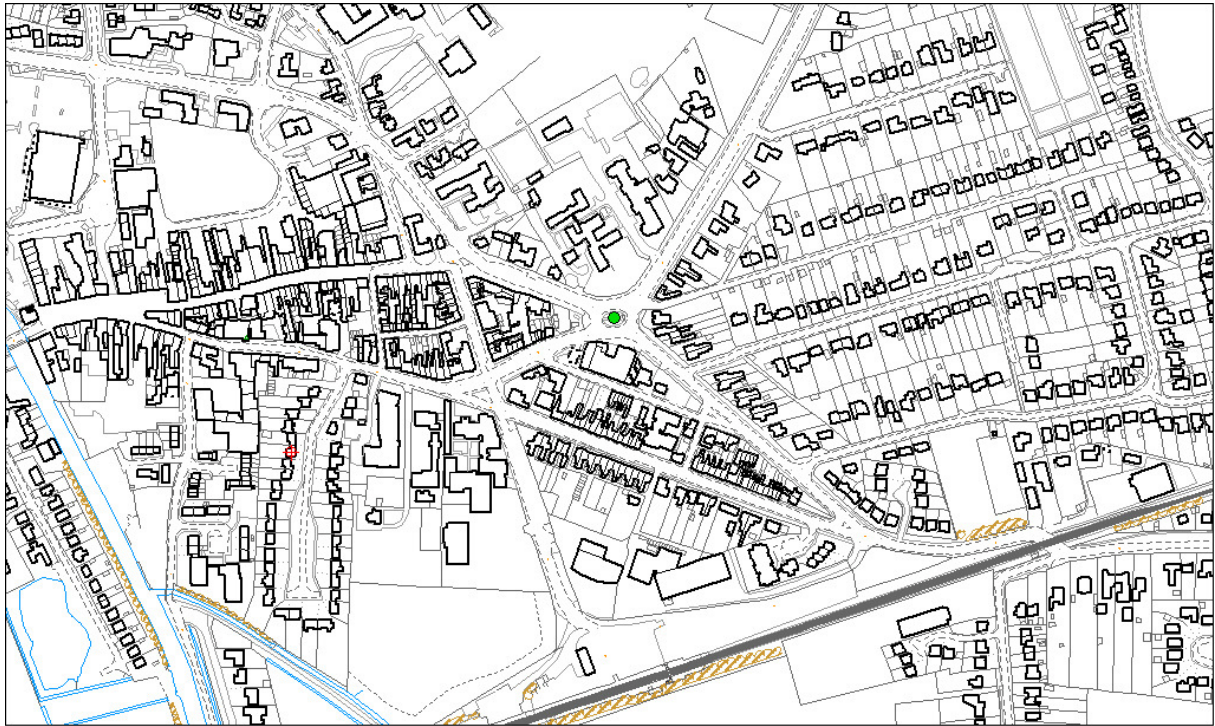
12. Busy streets where people spend more than 1 hour close to traffic – Ashby High Street



13. Junctions – Britannia Corner



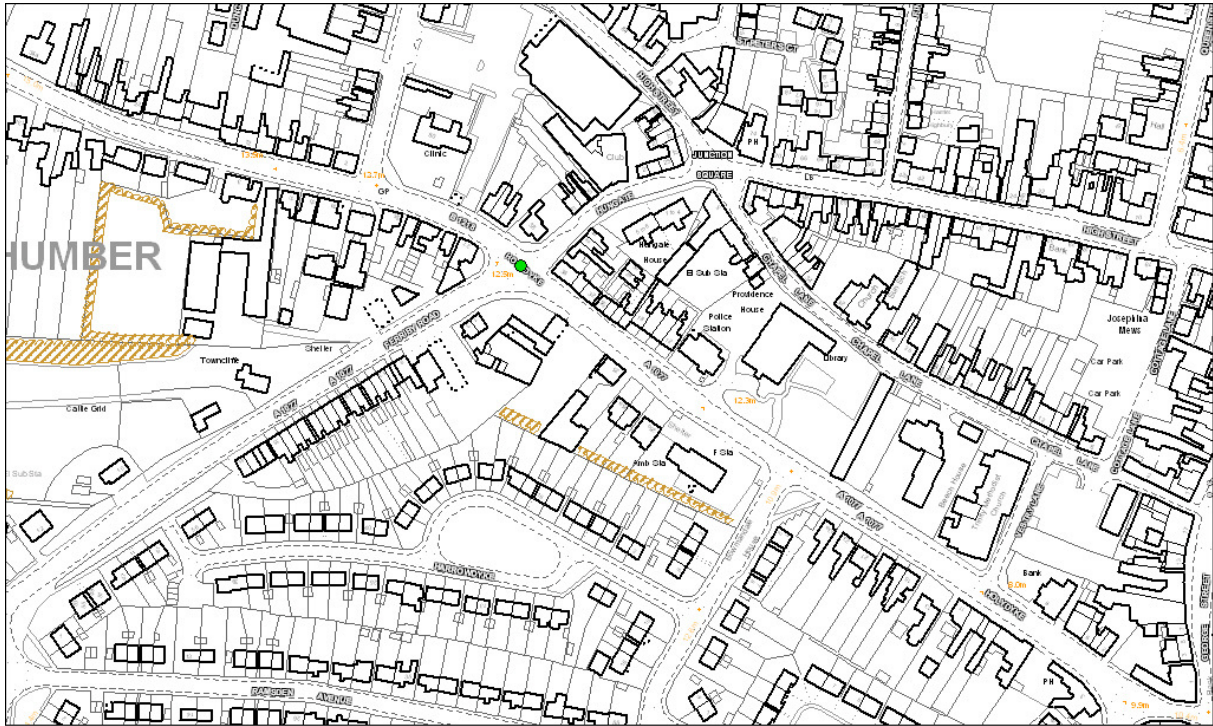
14. Junctions – Ashby Road, West Common Lane



15. Junctions – Brigg Monument



16. Junctions – Messingham Road, Burringham Road



17. Junctions – Ferriby Road, Hoydyke



18. Junctions – Ashby High Street, Ashby Road

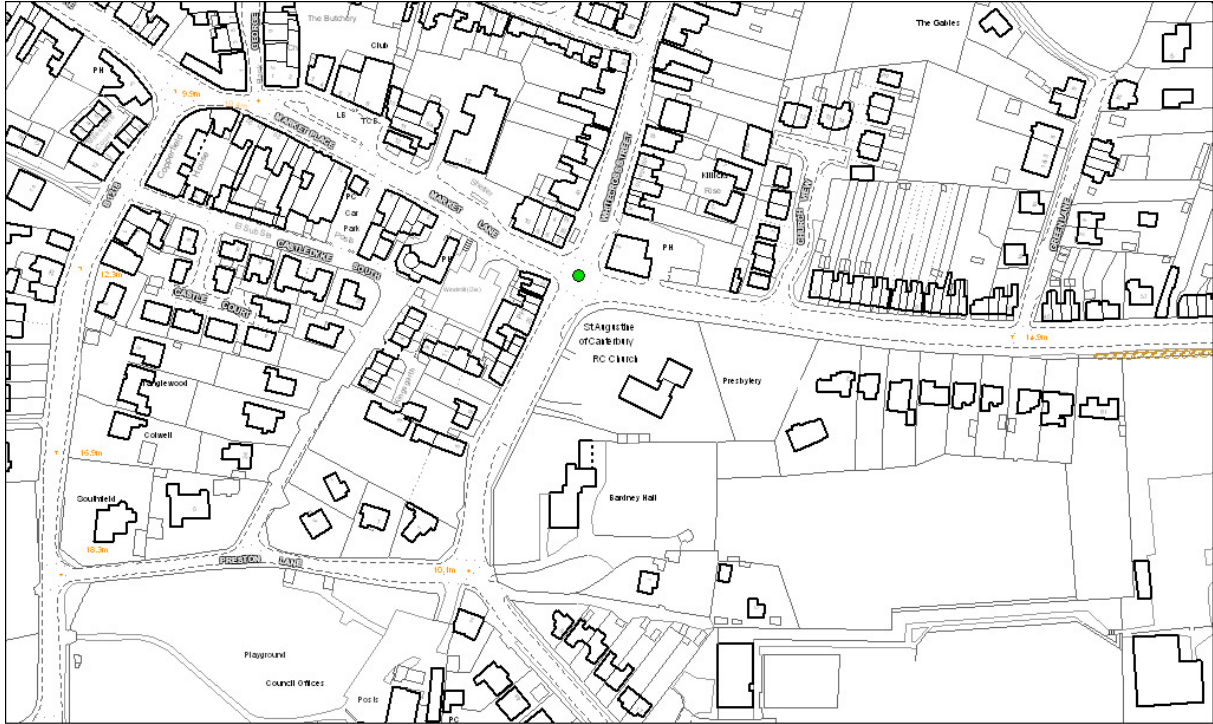
North Lincolnshire Council - England



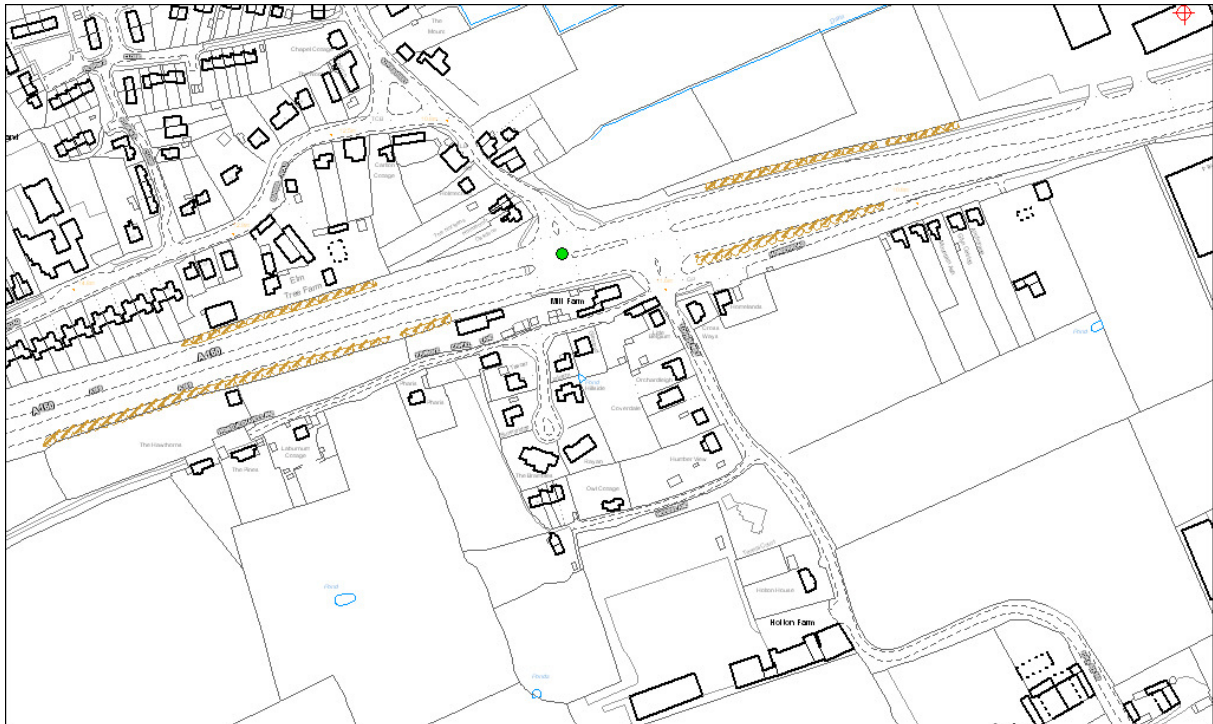
19. Junctions – Barnard Avenue, A18



20. Junctions – Messingham Road, Chancel Road

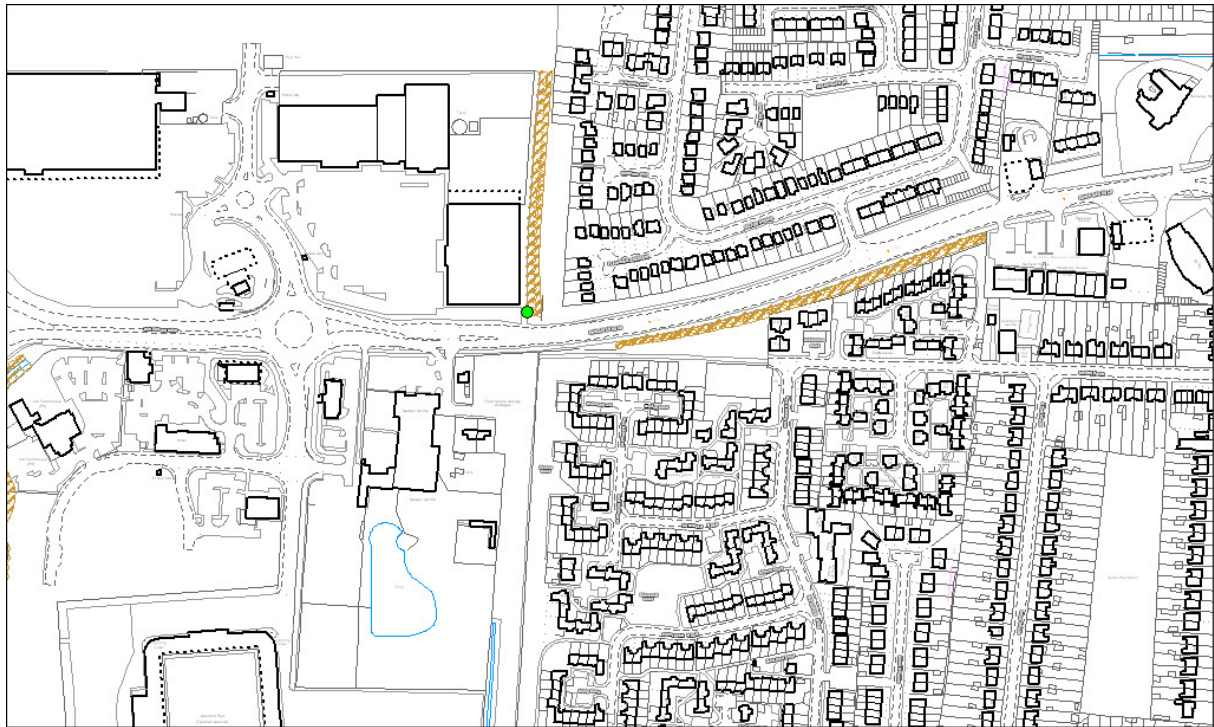


21. Junctions – Barrow Road, Whitecross Street



22. Roads with High Concentrations of HGVs – Humber Road

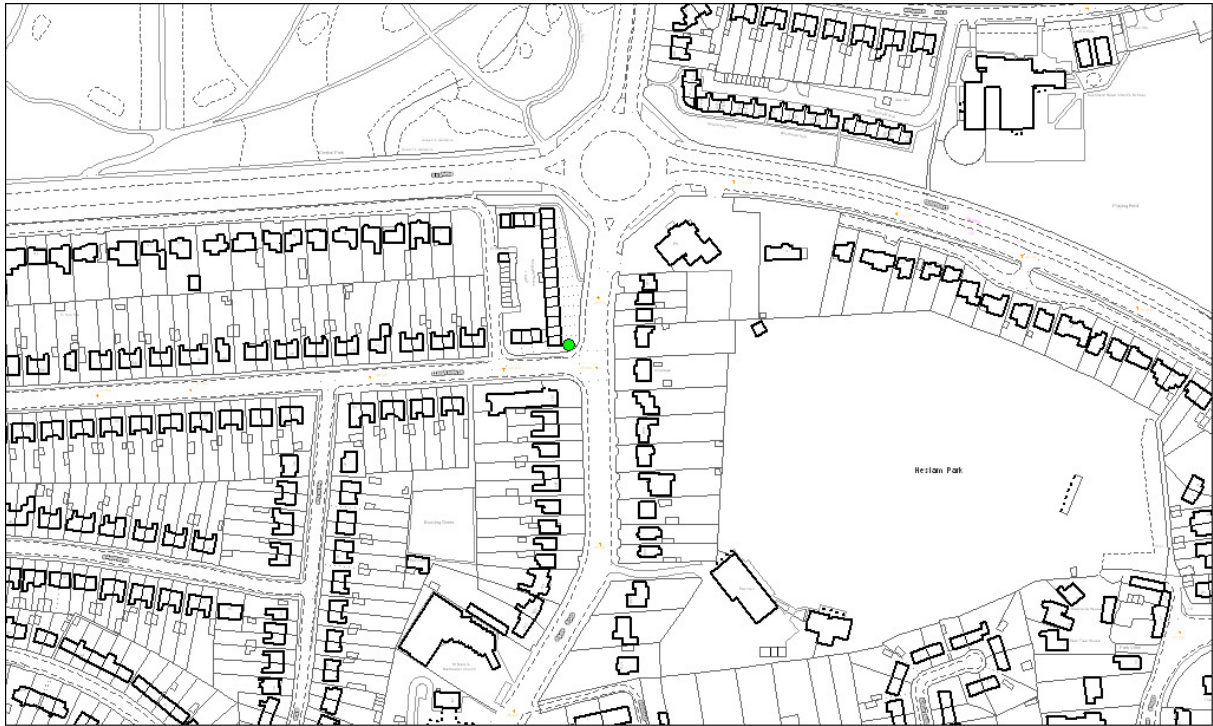
Appendix C: Monitoring Locations



1. Gallagher Retail Park – Airpointer



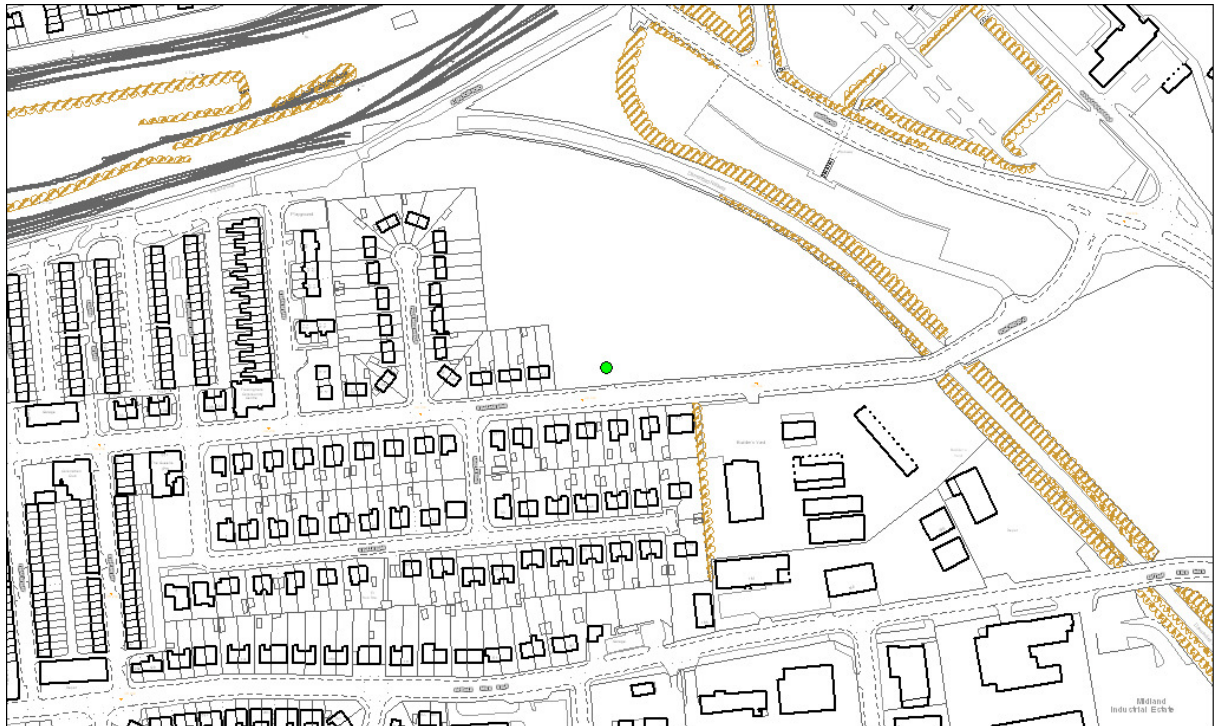
2. Allanby Street - TEOM



3. Kingsway House - Airpointer



4. Lincoln Gardens – TEOM



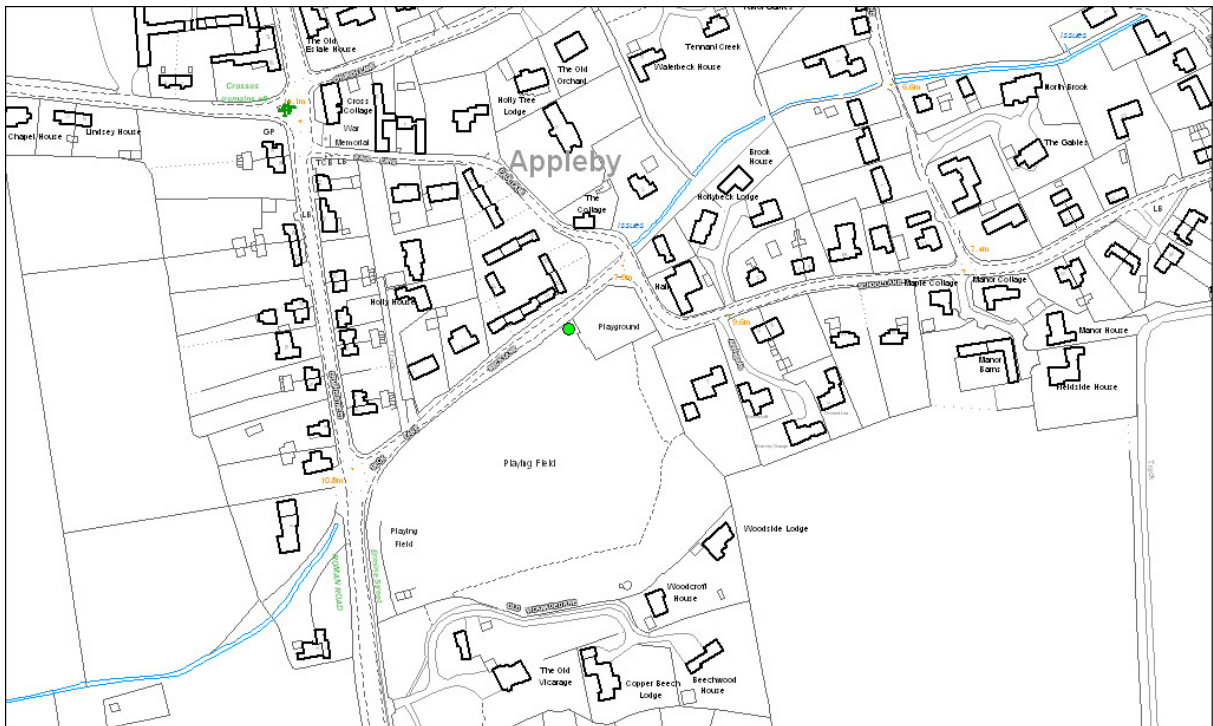
5. Scunthorpe Town (AURN) – NOX, SO2, TEOM, Partisol, PAH, Heavy Metals



6. East Common Lane – TEOM



7. Santon – NOx, SO2, TEOM, Partisol, PAH, Heavy Metals

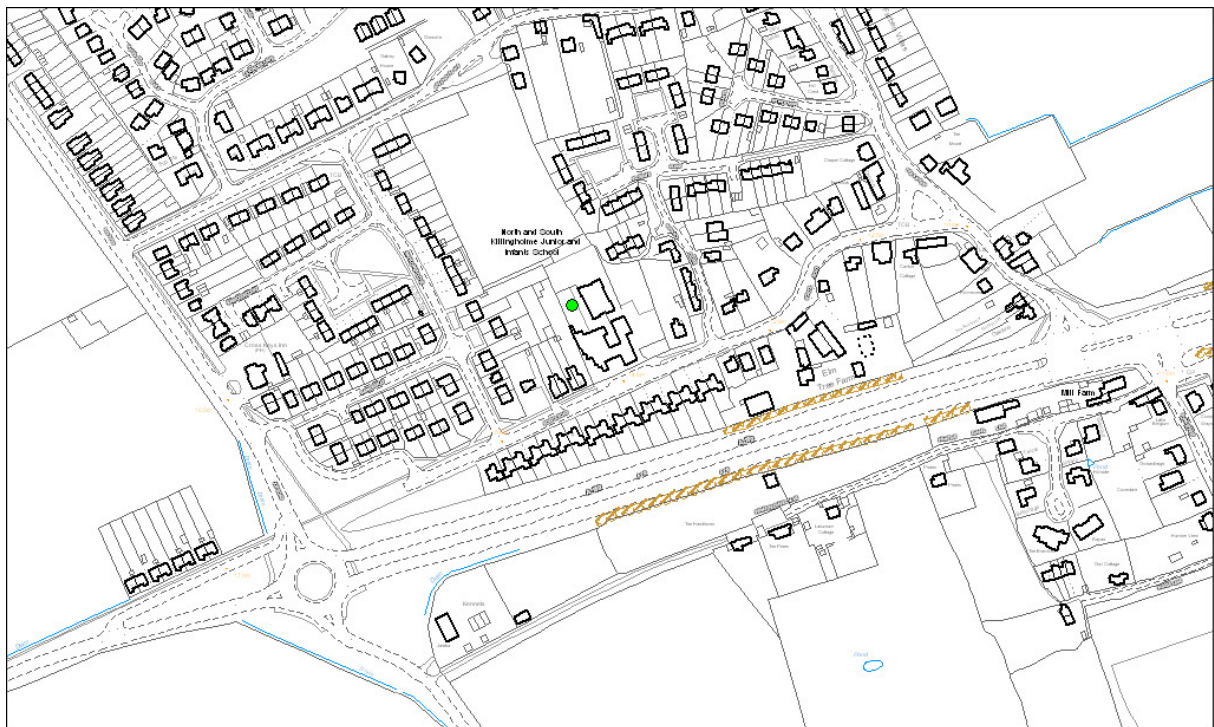


8. Appleby Village – TEOM

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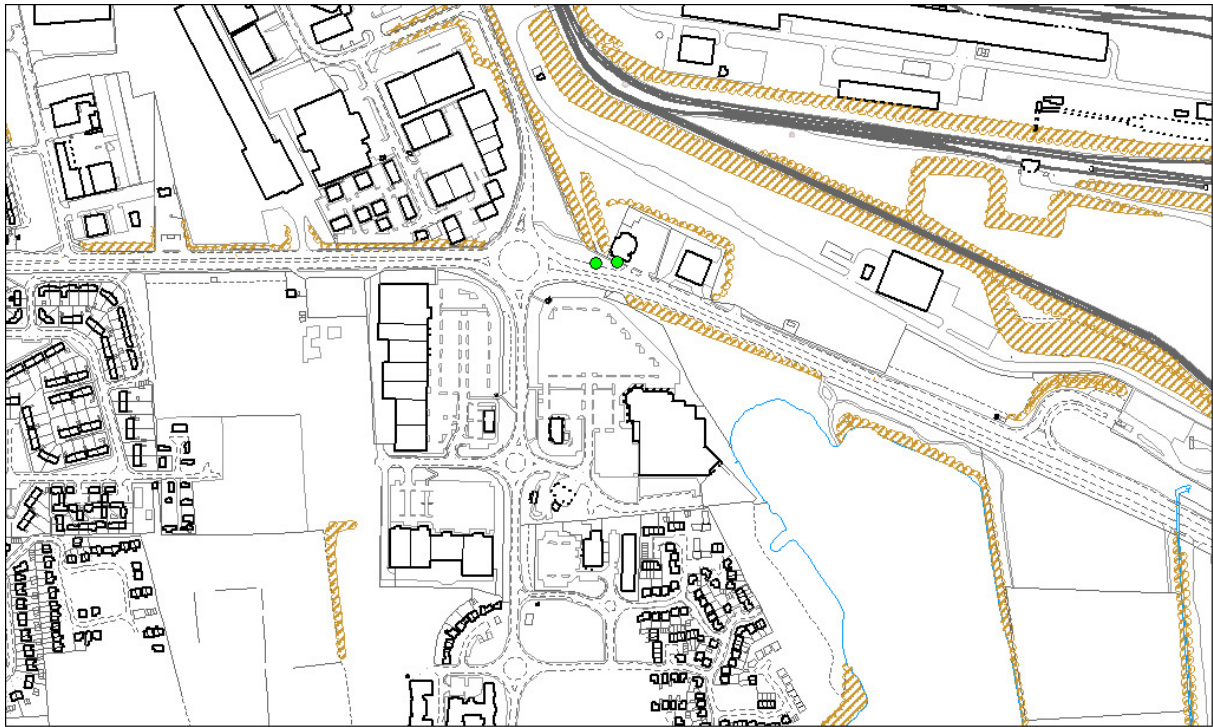


9. Broughton – TEOM

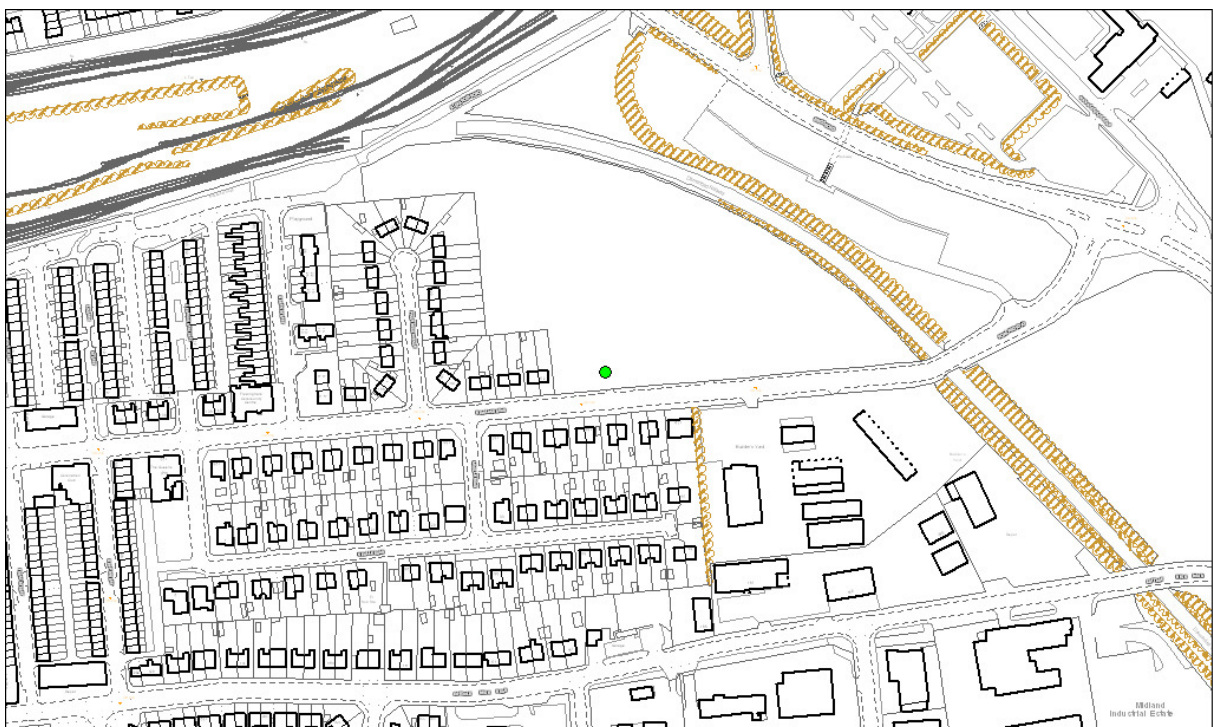


10. Killingholme – NOX, SO2, TEOM

Appendix D: Diffusion Tubes

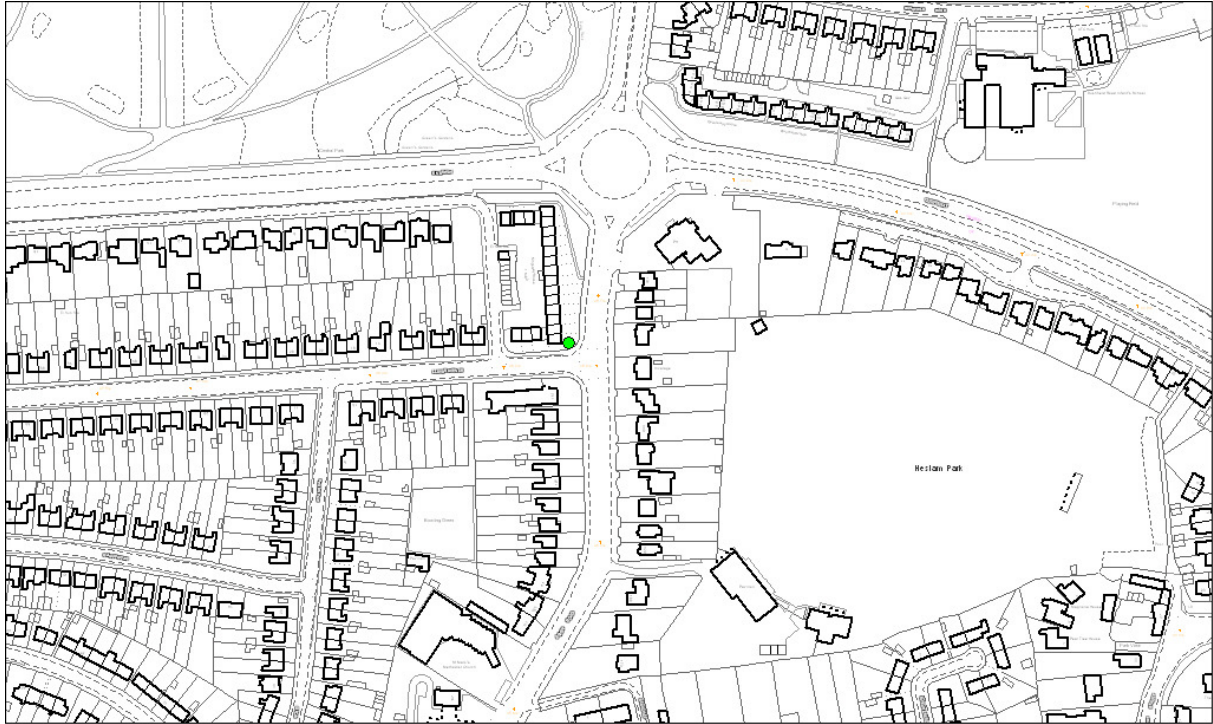


Tube 27 & 28. Exceedance at Brigg Road

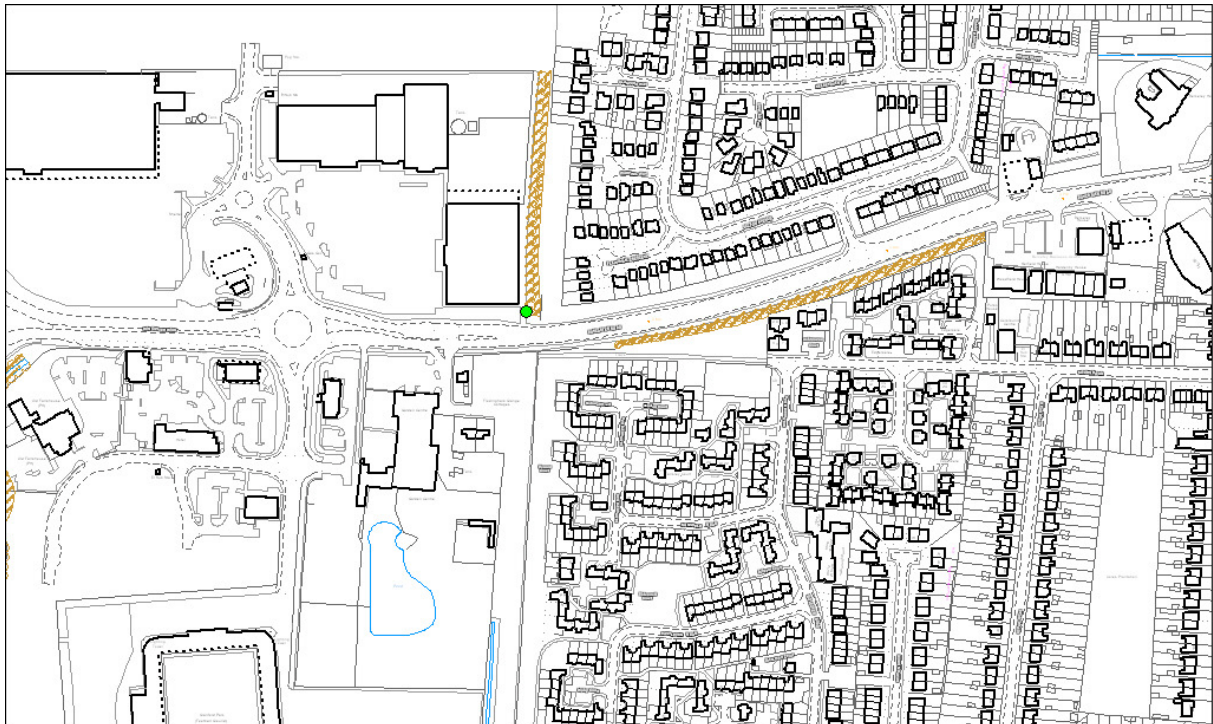


Rowland Road co-location study – Tubes 36, 37 & 38

North Lincolnshire Council - England

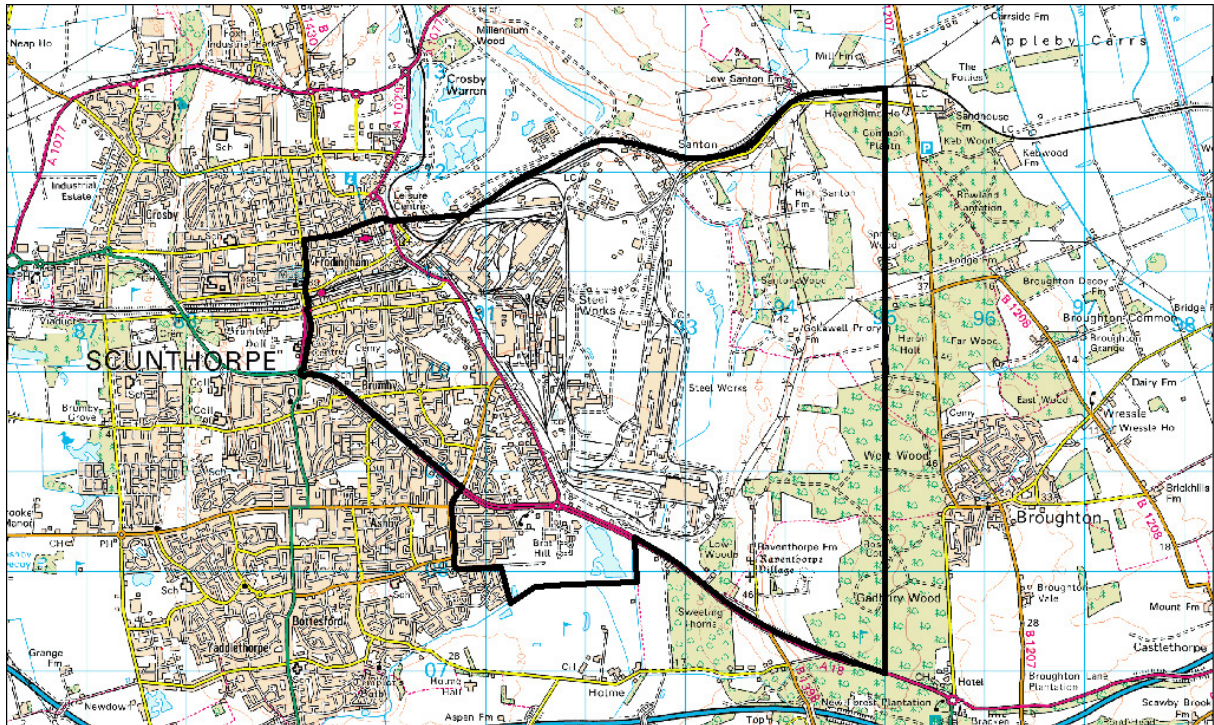


Kingsway House co-location study – Tubes 17, 18 & 19

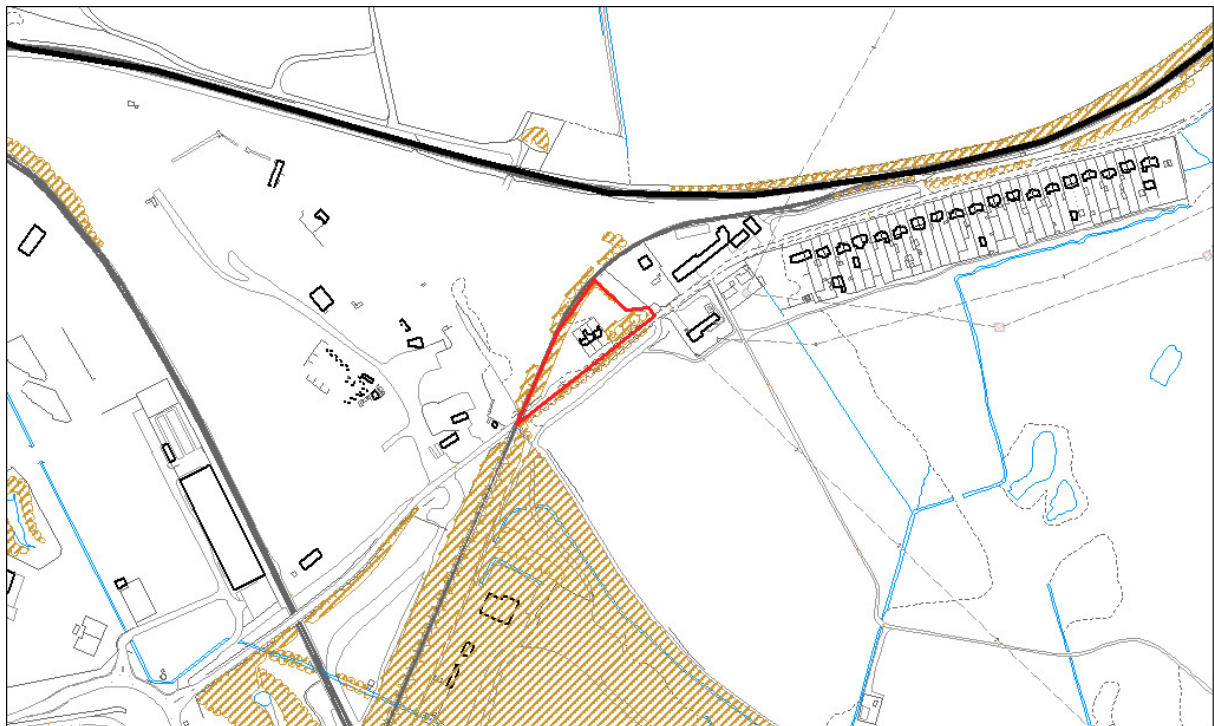


Gallagher Retail Park co-location study – Tubes 6, 7 & 8

Appendix E: Current AQMAs

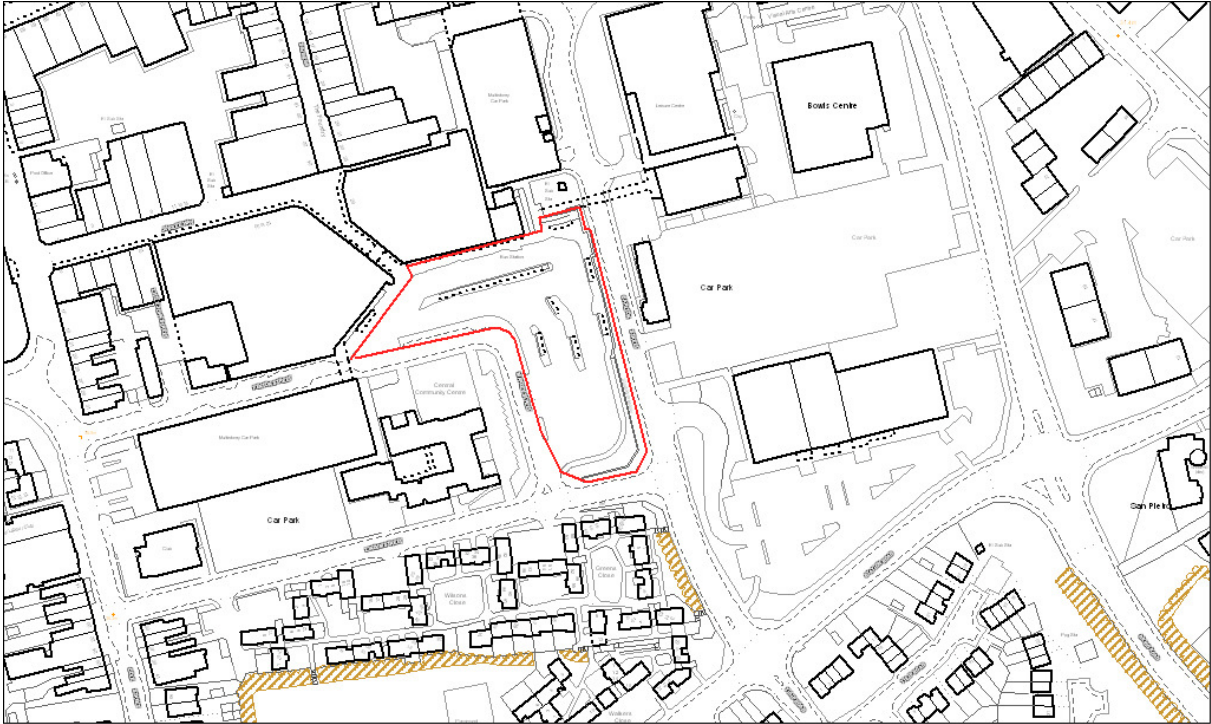


2005 Scunthorpe Town AQMA, for breaches of Daily Objectives



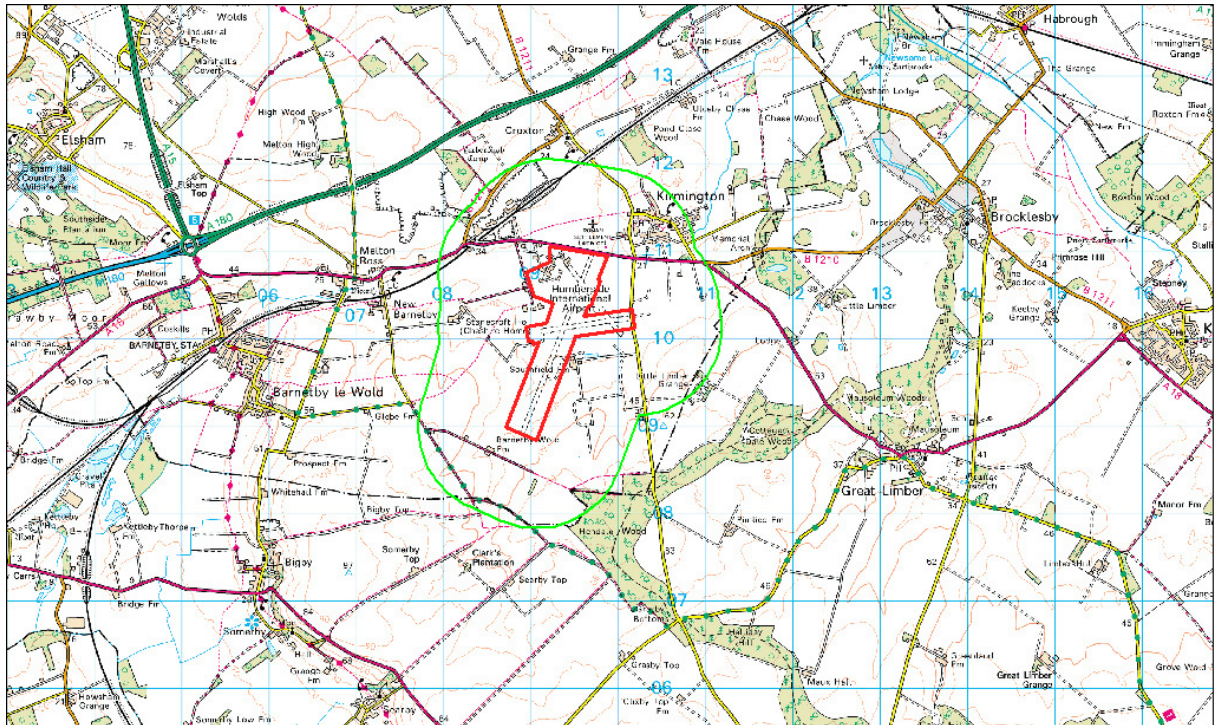
2008 Santon AQMA, for the breach of the Annual Mean Objective

Appendix F: Bus & Coach Stations



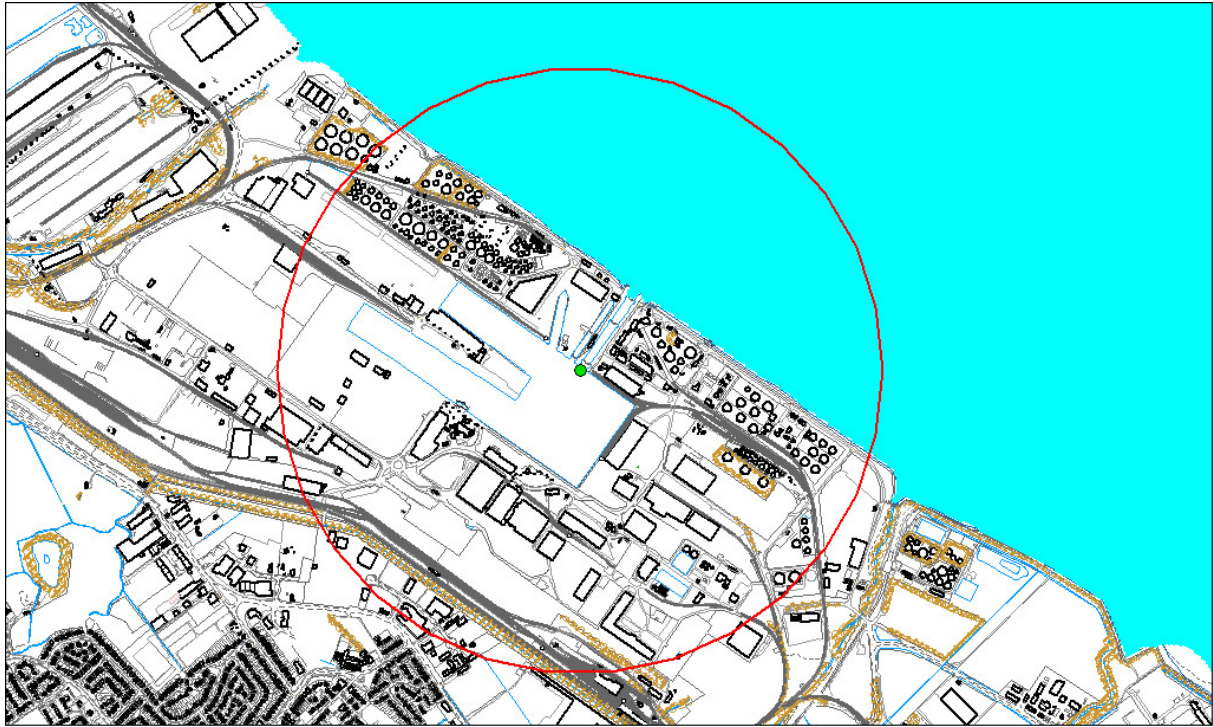
Scunthorpe Bus Station Boundary

Appendix G: Airports

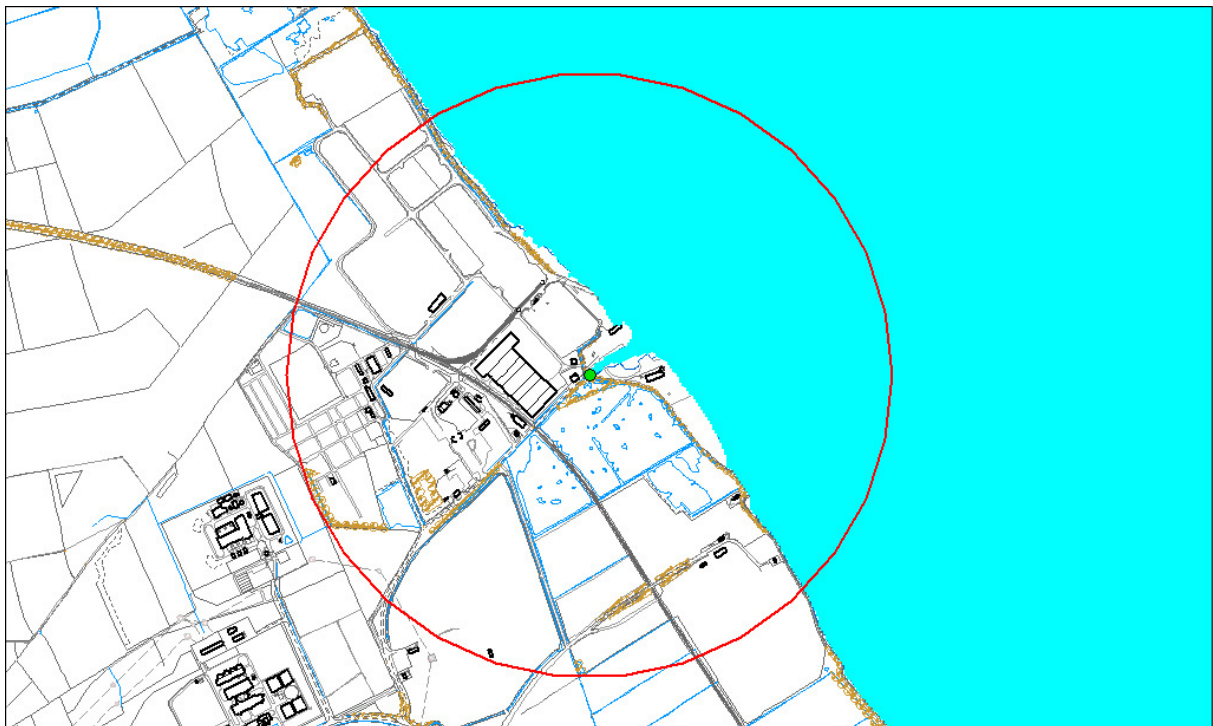


Hunberside Airport Boundary and 1km Radius

Appendix H: Shipping Ports



Humber International Terminal & 1km Radius



North Killingholme Haven Port

Appendix I: NOX to NO2 Calculator

This spreadsheet calculates the nitrogen dioxide concentration from the modelled oxides of nitrogen concentrations

- Confirm that the General inputs spreadsheet has been completed
The input selections are shown at the head of the Table below.
- Type in (or paste and copy from another spreadsheet)
 - the receptor identifier (Receptor ID) and its Easting and Northing. [Optional]
 - the modelled contribution from roads to oxides of nitrogen concentrations (Road increment NO_x)
 - the local background concentration as NO_x
You may alternatively enter the local background as NO_2 , for example, if you have modelled a regional background. Leave the redundant background NO_x or NO_2 columns blank as appropriate
- The default set-up is to use the fraction of oxides emitted as NO_2 from the General Inputs spreadsheet
Leave the "Fraction emitted as NO_2 " column empty to use the default set up.
However, you can overwrite the defaults by typing appropriate values (0-1) into this column.
The NO_2 spreadsheet provides additional values.
- Click the mouse on the run button to run the model.
The model will calculate:
 - the total nitrogen dioxide concentration at the receptor (Total NO_2)
 - the incremental contribution to nitrogen dioxide concentrations from the road vehicle emissions (Road NO_2)

Copy and paste the results to another spreadsheet.
- Click the mouse on the Clear button to clear the spreadsheet.

Receptor ID	Easting, m	Northing, m	Road increment NO_x $\mu\text{g m}^{-3}$	Background NO_x		Fraction emitted as NO_2	2008 Traffic Mix:		Notes
				$\mu\text{g m}^{-3}$	NO_2		All UK traffic	Road NO_2 $\mu\text{g m}^{-3}$	
1	489188	408908	20.9	21.8	17.1		26.27	9.17	
2	489243	410665	33.6	35.9	23.5		36.85	13.35	
3	489209	409945	20.6	34.7	23		31.53	8.53	
4	498651	406724	10.8	19	15.8		20.76	4.96	
5	500323	507220	23.7	18.5	15.6		26.01	10.41	
6	489182	410137	25.1	35.9	23.5		33.79	10.29	
7	489642	407097	25.3	20.7	16.6		27.56	10.96	
8	489326	408003	21.4	22.7	17.5		26.84	9.34	
9	489506	411740	16.4	35.1	23.2		30.16	6.96	
10	489048	412127	17	21.8	17.1		24.66	7.56	
11	501630	508530	16.4	18.2	15.5		22.9	7.4	
12	489343	408645	14.5	21.8	17.1		23.61	6.51	
13	489189	411333	24.7	25.1	23.2		33.37	10.17	
14	489073	409557	17.3	24.7	23		30.33	7.33	
15	500405	507203	18.1	18.5	15.8		23.71	8.11	
16	489245	408646	12.6	21.6	17.1		22.79	5.69	
17	502051	522043	15.8	18.1	15.4		22.55	7.15	
18	489054	408628	17.7	20.7	16.6		24.48	7.88	
19	499925	407429	12.6	22.5	17.2		22.89	5.89	
20	489103	407751	21	21.8	17.1		26.31	9.21	
21	503295	521787	14.6	21	20.5		26.88	6.38	
22	515278	518079	57.1	15.7	12.3		35.1	22.8	

NOX to NO2 Calculator Results

This spreadsheet allows the user to specify input parameters that generally apply throughout the calculation. These include the regional concentrations of ozone, oxides of nitrogen and nitrogen dioxide above the surface layer and the fraction of oxides of nitrogen emitted as nitrogen dioxide

- Specify year of modelling assessment or monitoring
Use the scroll bar to scroll the year up or down

2008
- Specify the local authority
Use the combobox to select your local authority

NORTH LINCOLNSHIRE
- Estimated regional concentrations above the surface layer

Ozone	60.3	$\mu\text{g m}^{-3}$
Oxides of nitrogen	13.0	$\mu\text{g m}^{-3}$ as NO_2
Nitrogen dioxide	10.6	$\mu\text{g m}^{-3}$
- Specify the traffic mix
Use the combobox bar to select your traffic mix

All UK traffic

Fraction NO_x emitted from local road vehicles as NO_2	0.151304
Regional fraction NO_x emitted as NO_2	0.151304

NOX to NO2 General Inputs

Appendix J: Bias Adjustment Calculations

Checking Precision and Accuracy of Triplicate Tubes

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	03/01/2008	30/01/2008	35	36	40	37	2.6	7	6.6
2	30/01/2008	27/02/2008	32	32	35	33	1.7	5	4.3
3	27/02/2008	02/04/2008	28	34	29	30	3.2	11	8.0
4	02/04/2008	29/04/2008	27	29	26	27	1.5	6	3.8
5	29/04/2008	28/05/2008	22	21	20	21	1.0	5	2.5
6	28/05/2008	01/07/2008	22	19	19	20	1.7	9	4.3
7	01/07/2008	30/07/2008	25	26	24	25	1.0	4	2.5
8	30/07/2008	03/09/2008	23	24	22	23	1.0	4	2.5
9	03/09/2008	01/10/2008	24	26	25	25	1.0	4	2.5
10	01/10/2008	29/10/2008	30	32	28	30	2.0	7	5.0
11	29/10/2008	03/12/2008	27	26	28	27	1.0	4	2.5
12	03/12/2008	07/02/2009	32	34	37	34	2.5	7	6.3
13									

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

AEA Energy & Environment
From the AEA group

Automatic Method		Data Quality Check	
Period Mean	Data Capture (% DC)	Tubes Precision Check	Automatic Monitor Data
32.5	100	Good	Good
42.8	100	Good	Good
27.2	100	Good	Good
31.2	100	Good	Good
24	100	Good	Good
21	100	Good	Good
22	100	Good	Good
19	100	Good	Good
24	100	Good	Good
27	100	Good	Good
26.1	100	Good	Good
38.4	100	Good	Good

Overall survey --> **Good precision** **Good Overall DC**
(Check average CV & DC from Accuracy calculations)

Site Name/ID: **Gallagher Retail Park**

Accuracy (with 95% confidence interval)
without periods with CV larger than 20%
Bias calculated using 12 periods of data
Bias factor A **1.01 (0.92 - 1.11)**
Bias B **-1% (-10% - 8%)**

Diffusion Tubes Mean: **28 μgm^{-3}**
Mean CV (Precision): **6**

Automatic Mean: **28 μgm^{-3}**
Data Capture for periods used: **100%**
Adjusted Tubes Mean: **28 (26 - 31) μgm^{-3}**

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

Accuracy (with 95% confidence interval)
WITH ALL DATA
Bias calculated using 12 periods of data
Bias factor A **1.01 (0.92 - 1.11)**
Bias B **-1% (-10% - 8%)**

Diffusion Tubes Mean: **28 μgm^{-3}**
Mean CV (Precision): **6**

Automatic Mean: **28 μgm^{-3}**
Data Capture for periods used: **100%**
Adjusted Tubes Mean: **28 (26 - 31) μgm^{-3}**

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Version 03 - November 2006

Gallagher Retail Park Bias Adjustment

Checking Precision and Accuracy of Triplicate Tubes

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	03/01/2008	30/01/2008	40	36	28	35	6.1	18	15.2
2	30/01/2008	27/02/2008	54	42	47	48	6.0	13	15.0
3	27/02/2008	02/04/2008	39	29	28	32	6.1	19	15.1
4	02/04/2008	29/04/2008	40	35	24	33	8.2	25	20.3
5	29/04/2008	28/05/2008	42	46	56	48	7.2	15	17.9
6	28/05/2008	01/07/2008	25	22	24	24	1.5	6	3.8
7	01/07/2008	30/07/2008	27	25	28	27	1.5	6	3.8
8	30/07/2008	03/09/2008	25	19	18	21	3.8	18	9.4
9	03/09/2008	01/10/2008	35	28	40	34	6.0	18	15.0
10	01/10/2008	29/10/2008	33	29	32	31	2.1	7	5.2
11	29/10/2008	03/12/2008	43	32	35	37	5.7	16	14.1
12	03/12/2008	07/02/2009	46	35	38	40	5.7	14	14.1
13									

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

AEA Energy & Environment
From the AEA group

Automatic Method		Data Quality Check	
Period Mean	Data Capture (% DC)	Tubes Precision Check	Automatic Monitor Data
38	100	Good	Good
56.8	100	Good	Good
27.8	100	Good	Good
38.7	100	Poor Precision	Good
44	100	Good	Good
22	97	Good	Good
21	99	Good	Good
18	99	Good	Good
26	100	Good	Good
24	100	Good	Good
16.5	100	Good	Good
41.9	100	Good	Good

Overall survey --> **Good precision** **Good Overall DC**
(Check average CV & DC from Accuracy calculations)

Site Name/ID: **Kingsway House**

Accuracy (with 95% confidence interval)
without periods with CV larger than 20%
Bias calculated using 11 periods of data
Bias factor A **0.9 (0.73 - 1.16)**
Bias B **12% (-13% - 37%)**

Diffusion Tubes Mean: **34 μgm^{-3}**
Mean CV (Precision): **14** caution

Automatic Mean: **31 μgm^{-3}**
Data Capture for periods used: **100%**
Adjusted Tubes Mean: **31 (25 - 40) μgm^{-3}**

Precision **11 out of 12 periods have a CV smaller than 20%**

Accuracy (with 95% confidence interval)
WITH ALL DATA
Bias calculated using 12 periods of data
Bias factor A **0.92 (0.75 - 1.17)**
Bias B **9% (-15% - 32%)**

Diffusion Tubes Mean: **34 μgm^{-3}**
Mean CV (Precision): **14** caution

Automatic Mean: **31 μgm^{-3}**
Data Capture for periods used: **100%**
Adjusted Tubes Mean: **31 (26 - 40) μgm^{-3}**

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Version 03 - November 2006

Kingsway House Bias Adjustment