# Executive Summary

As part of the National Air Quality Strategy, North Lincolnshire Council is required to produce a progress report documenting its position with regard to local air quality management. This report will build on and update the Authority's earlier Air Quality Reports.

The Progress Report provides an overview of all the pollution monitoring data collected by the authority, with particular reference to 2004 and considers the data in the context of the government's air quality objectives.

The Council's Updating and Screening Assessment (USA) published in May 2003 identified a number of possible exceedences of the Air Quality Objectives and consequently the authority proceeded to a Detailed Assessment in a number of areas, namely:

- Industrial emissions of Benzene in Killingholme
- Industrial emissions of Benzene in Scunthorpe
- Industrial emissions of $SO_2$ in Killingholme
- Emissions of $SO_2$ from domestic solid fuel burning in Keadby
- Industrial emissions of $PM_{10}$ in Scunthorpe
- Emissions of $PM_{10}$ from quarries and landfills in Barnetby
- Emissions of $PM_{10}$ from domestic solid fuel burning in Keadby

The Detailed Assessment published in April 2004 reported on most of the above issues however it only reported on the pro rata results of the monitoring surveys implemented for Benzene and the Keadby survey. Due to the time taken to implement appropriate monitoring regimes for the Detailed Assessment the full results of the Benzene monitoring and $PM_{10}$ and $SO_2$ monitoring in Keadby will be reported in this Progress Report.

The 2004 Detailed Assessment also concluded that an Air Quality Management Area should be declared in Scunthorpe and consequently further work on $PM_{10}$ emissions in Scunthorpe is continuing.

The report also identifies significant planning decisions with an impact on air quality and reviews traffic data that may have changed since completion of the Updating and Screening Assessment in May 2003.

From the results of the monitoring data in this Progress Report, it is proposed that the following actions be implemented

- The benzene diffusion tube survey will 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 $5\mu g/m^3$ .

- In the two locations identified in Scunthorpe as likely to breach the annual mean air quality objective for nitrogen dioxide of 40$\mu g/m^3$, a chemiluminescence NOx analyser will be 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$\mu g/m^3$ 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 $PM_{10}$.

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# 1.0 Introduction

The concept of Local Air Quality Management was introduced under Part IV of the Environment Act 1995 ('The Act'). Section 82 of the Act placed a duty on all Local Authorities to review air quality in their area with respect to a number of Air Quality Objectives. The Air Quality Objectives were subsequently formalised in the Air Quality Regulations 1997, 2000 and 2002.('The Regulations').

Air Quality Objectives can be defined as the Government's medium term objectives. They are based on Air Quality Standards set by the Expert Panel on Air Quality Standards (EPAQS) and are the maximum acceptable level of a pollutant in the air that will not present a risk to the health of the most susceptible groups in the population. The Air Quality Objectives include date(s) by which the Standards must be achieved. The length of time to achieve the Standard for each pollutant takes into account the costs to industry, the expected rate of improvements in available technology and the health effects on the country's population.

Having completed the first round of Review and Assessment the Council is now underway with the second round, focusing on areas that have changed since the Updating and Screening Assessment and any subsequent impacts this might have on the Air Quality Objectives. Having identified in the Detailed Assessment the need to declare an Air Quality Management Area (AQMA) in Scunthorpe for $PM_{10}$ the Council continues with its further assessment in this area to determine the relative contributions of different sources of $PM_{10}$.

This Progress Report has been completed in accordance with the Progress Report Guidance LAQM.PRG(03). Where this progress report identifies a risk that an air quality objective will be exceeded at a location with relevant public exposure, further monitoring is proposed.

The Air Quality Objectives for the seven pollutants are listed in Table 2. Table 3 documents the provisional objectives proposed for $PM_{10}$ by 2010. Where an objective is unlikely to be achieved within North Lincolnshire the area must be designated an Air Quality Management Area. The Authority must then develop and implement a local action plan setting out measures to reduce pollution levels.

## 1.1 Purpose of this Report

North Lincolnshire Council is required to regularly assess air quality under the Environment Act 1995 and produce annual reports in accordance with the timetable produced by DEFRA in Table 1.

The purpose of this Progress Report is to provide an overview of all the pollution monitoring data collected by the authority and consider it in the context of the government's air quality objectives.

The report also identifies significant planning decisions with an impact on air quality and reviews traffic data that may have changed since completion of the last Updating and Screening Assessment in May 2003.

A review of air quality means a consideration of the levels of pollutants in the air for which objectives are prescribed in Regulations, and estimations of likely future levels. An assessment of air quality is the consideration of whether estimated levels for the relevant future period are likely to exceed the levels set in the objectives.

The Regulations make it clear, however, that likely exceedences of the objectives should be assessed in relation to 'the quality of the air at locations which are situated outside of buildings or other natural or man made structures, above or below ground, and where members of the public are regularly present'. This report will therefore focus on locations where members of the public are likely to be regularly present and are likely to be exposed over the averaging period of the objective.

## 1.2 Air Quality Review & Assessment Report Requirements

**Table 1 Timetable for Review and Assessment:**

| LAQM Activity | Completion Date | Local Authority |
|---|---|---|
| Updating & Screening Assessment | End of May 2003 | All Authorities |
| Detailed Assessment | End of April 2004 | Authorities who identified NEED in USA 2003 for Detailed Assessment. |
| Progress Report | End of April 2004 | Authorities who identified NO NEED in USA 2003 for Detailed Assessment. |
| Progress Report | End of April 2005 | All Authorities |
| Updating & Screening Assessment | End of April 2006 | All Authorities |
| Detailed Assessment | End of April 2007 | Authorities who identified NEED in USA 2006 for Detailed Assessment. |
| Progress Report | End of April 2007 | Authorities who identified NO NEED in USA 2006 for Detailed Assessment. |
| Progress Report | End of April 2008 | All Authorities |
| Updating & Screening Assessment | End of April 2009 | All Authorities |
| Detailed Assessment | End of April 2010 | Authorities who identified NEED in USA 2009 for Detailed Assessment. |
| Progress Report | End of April 2010 | Authorities who identified NO NEED in USA 2009 for Detailed Assessment. |

## 1.3 Air Quality Strategy Objectives – Current and Proposed

**Table 2 Objectives in the Air Quality Regulations 2000 & (Amendment) Regulations 2002 for Local Air Quality Management**

| Pollutant | Objective | | To be Achieved By |
|---|---|---|---|
| | Concentration | Measured as | |
| Particles $PM_{10}$ *(1) | 50μg/m$^3$ not to be exceeded more than 35 times a year *(2) | 24-Hour Mean | 31/12/2004 |
| | 40μg/m$^3$ *(2) | Annual Mean | 31/12/2004 |
| Nitrogen Dioxide | 200μg/m$^3$ not to be exceeded more than 18 times a year. *(2) | 1-Hour Mean | 31/12/2005 |
| | 40μg/m$^3$ *(2) | Annual Mean | 31/12/2005 |
| Sulphur Dioxide | 350μg/m$^3$ not to be exceeded more than 24 times a year. *(2) | 1-Hour | 31/12/2004 |
| | 125μg/m$^3$ not to be exceeded more than 3 times a year. *(2) | 24-Hour Mean | 31/12/2004 |
| | 266μg/m$^3$ not to be exceeded more than 35 times a year. *(2) | 15-Minute Mean | 31/12/2005 |
| Carbon Monoxide | 10.0mg/m$^3$ *(3) | Maximum Daily Running 8-Hour Mean | 31/12/2003 |
| Benzene | 16.25μg/m$^3$ *(2) | Running Annual Mean | 31/12/2003 |
| | 5μg/m$^3$ *(2) | Annual Mean | 31/01/2010 |
| 1,3-Butadiene | 2.25μg/m$^3$ *(2) | Running Annual Mean | 31/12/2003 |
| Lead | 0.5μg/m$^3$ *(2) | Annual Mean | 31/12/2004 |
| | 0.25μg/m$^3$ *(2) | Annual Mean | 31/12/2008 |

*(1) "$PM_{10}$" - Particulate Matter less than 10 microns in diameter.

*(2) "μg/m$^3$" - micrograms per cubic metre

*(3) "mg/m$^3$" - milligrams per cubic metre.

**Table 3 Proposed New Particle Objectives for England not included in Regulations**

| Pollutant | Objective | | To be Achieved By |
|---|---|---|---|
| | **Concentration** | **Measured as** | |
| Particles $PM_{10}$ *(1) | $50\mu g/m^3$ not to be exceeded more than 7 times a year * (2) | 24-Hour Mean | 31/12/2010 |
| | $20\mu g/m^3$ * (2) | Annual Mean | 31/12/2010 |

*(1) "$PM_{10}$" - Particulate Matter less than 10 microns in diameter.
*(2) "$\mu g/m^3$" - micrograms per cubic metre
*(3) "$mg/m^3$" - milligrams per cubic metre.

## 1.4 Conclusions of Previous Review & Assessment Reports

North Lincolnshire Council did not declare any Air Quality Management Areas as a result of the first round of review and assessment.

The Updating & Screening Assessment in May 2003 concluded that a Detailed Assessment was required in relation to the following:-

- Industrial emissions of Benzene in Killingholme
- Industrial emissions of Benzene in Scunthorpe
- Industrial emissions of $SO_2$ in Killingholme
- Emissions of $SO_2$ from domestic solid fuel burning in Keadby
- Industrial emissions of $PM_{10}$ in Scunthorpe
- Emissions of $PM_{10}$ from quarries and landfills in Barnetby
- Emissions of $PM_{10}$ from domestic solid fuel burning in Keadby

The Detailed Assessment produced in April 2004 concluded that North Lincolnshire was unlikely to achieve the 24-hour mean air quality objective in Scunthorpe for $PM_{10,}$ although it was likely to meet all the other air quality objectives.

Consequently North Lincolnshire Council is in the process of declaring an Air Quality Management Area (AQMA) for $PM_{10}$ in Scunthorpe.

# 2.0 New Monitoring Data

## 2.1 Introduction

North Lincolnshire Council undertakes ambient air quality monitoring for the following pollutants:

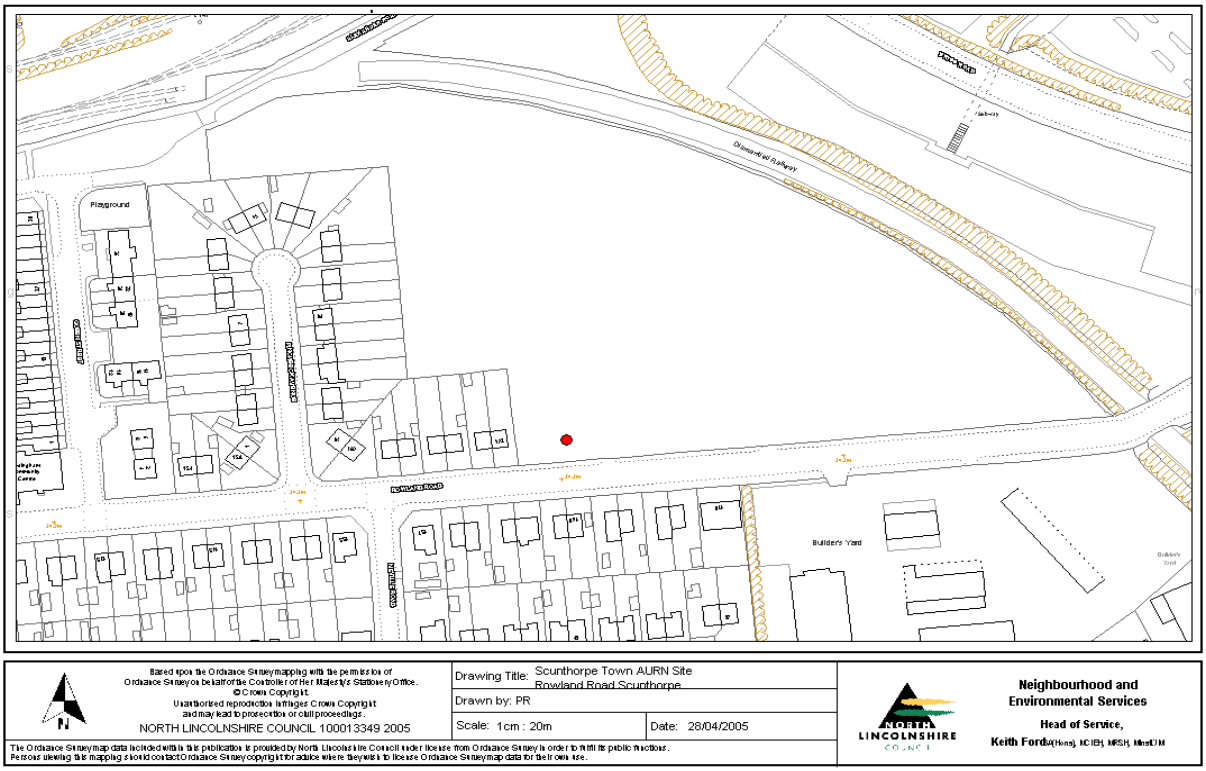
- $PM_{10}$
- $NO_2$
- $SO_2$
- Benzene
- Polycyclic Aromatic Hydrocarbons (PAH's)

The Regulations state that potential exceedances of the objectives should be assessed "at locations which are situated outside of buildings or other natural or man-made structures, above or below ground, and where members of the public are regularly present". Therefore monitoring sites are located in relevant locations, where members of the public are likely to be exposed over the averaging period of the objective. A table of the locations considered "relevant" for each objective's averaging period is given in DEFRA guidance LAQM.TG(03), a copy of which is shown in Appendix 10.

### 2.1.1 Automatic Monitoring Sites

The Council operates three Automatic Monitoring Stations. Two of the sites are permanent and one station is mobile, the mobile station (or Groundhog as it is known) can be relocated in order to monitor particular issues as they arise.
During 2004 the Automatic Monitoring Stations were located at the following sites:

**Figure 1 Scunthorpe Town AURN Site, Rowland Road, Scunthorpe**




The Scunthorpe Town AURN site on Rowland Road, Scunthorpe (Fig 1) was commissioned in July 2004, prior to this date it was located at the council's Neighbourhood & Environmental Services depot at Cottage Beck Road, Scunthorpe. The site was first installed in 1997 in close proximity to the Corus Integrated Steelworks site to measure pollutant concentrations in the town.

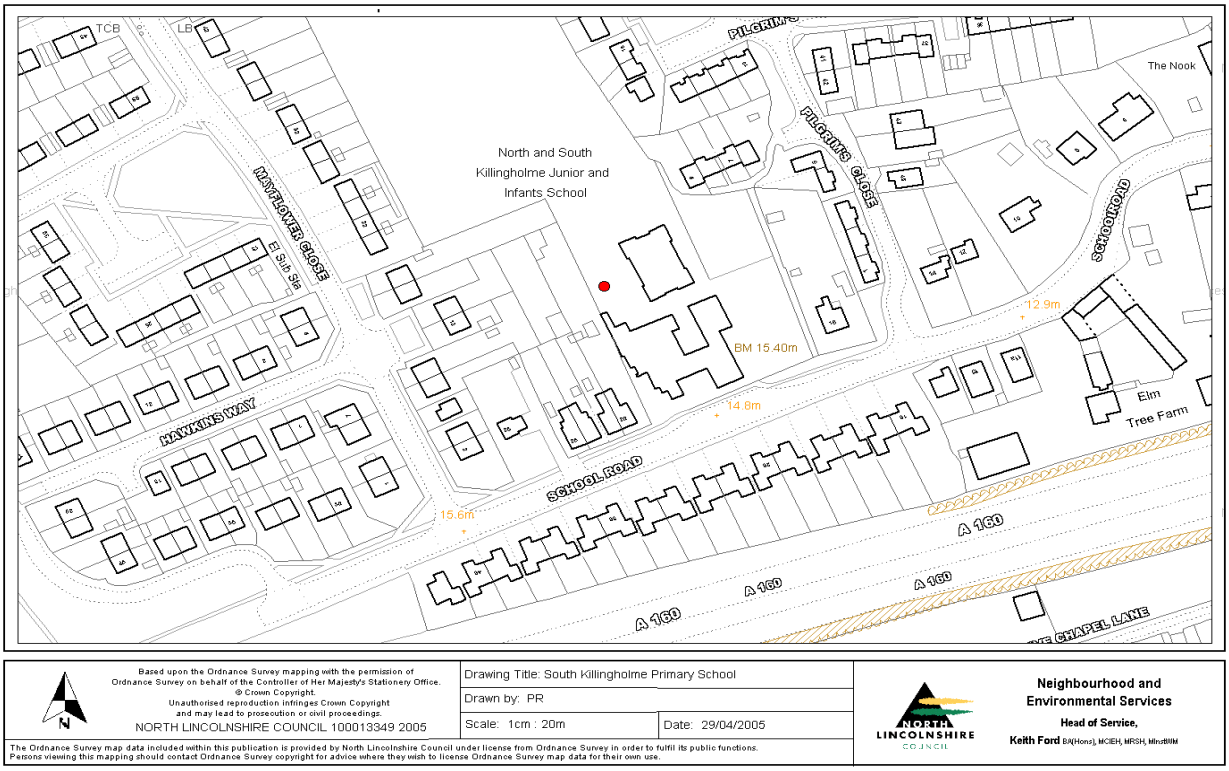
The site was relocated in July 2004 to ensure that measured concentrations more accurately represented exposure at a relevant location as defined in DEFRA Technical Guidance LAQM.TG(03). The new site is located adjacent to the residential properties on Rowland Road at the north- eastern end of the Scunthorpe steelworks.

The Automatic Monitoring Station measures for the following pollutants and includes a meteorological station:

- $PM_{10}$
- $NO_2$
- $SO_2$

$PM_{10}$ and $SO_2$ data from the Rowland Road site forms part of the Automated Urban and Rural Network (AURN) and consequently undergoes stringent QA/QC in accordance with DEFRA requirements. Data can be viewed at www.airquality.co.uk

**Figure 2 Killingholme Primary School, South Killinghome**




The Killingholme air quality monitoring station (Fig 2) was relocated in July 2003 to Killinghome Primary School, South Killingholme to ensure that measured concentrations more accurately represented exposure at a relevant location as defined in DEFRA Technical Guidance LAQM.TG(03).

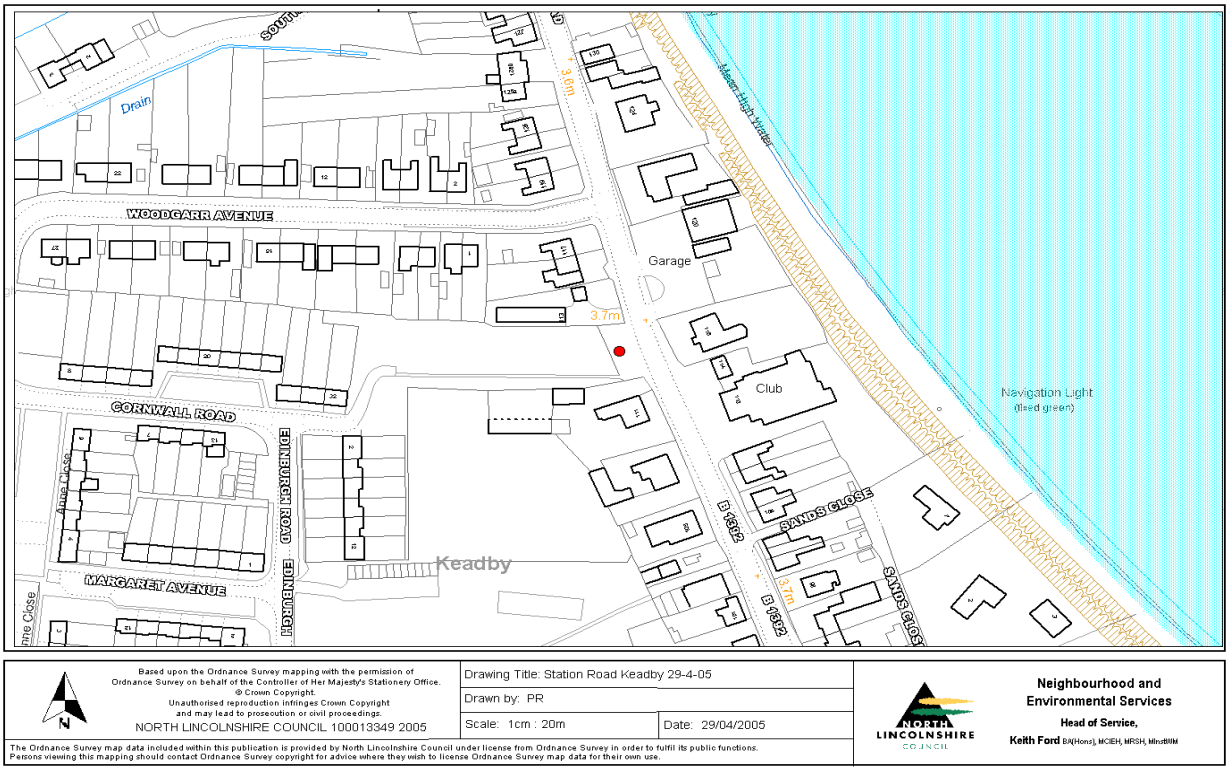
Killinghome is an industrial area with a number of refineries and gas fired power stations. The new air quality monitoring station was installed and commissioned with the cooperation of the local companies operating Part A installations in the vicinity. The companies continue to contribute to the ongoing running and maintenance costs associated with the site.

The Automatic Monitoring Station measures for the following pollutants and includes a meteorological station:

- $PM_{10}$
- $NO_2$
- $SO_2$

Data from this site undergoes the same process for QA/QC as is required by the DEFRA AURN Network although this is conducted by NETCEN in accordance with their Calibration Club specification.

**Figure 3 Station Road, Keadby**




The Keadby air quality monitoring station (Fig 3) was located in January 2004 at Station Road, Keadby to measure levels of $PM_{10}$ and $SO_2$ resulting from the burning of solid fuel in residential dwellings in Keadby. The village of Keadby does not have access to a mains gas supply and therefore places a heavy reliance on the use of solid fuel. The station was sited in a location representative of the exposure of residents of Keadby as defined in DEFRA Technical Guidance LAQM.TG(03).

The Automatic Monitoring Station measures for the following pollutants:

- $PM_{10}$
- $NO_2$
- $SO_2$

Data from this site undergoes the same process for QA/QC as is required by the DEFRA AURN Network although this is conducted by NETCEN in accordance with their Calibration Club specification.

### 2.1.2 Diffusion Tube Sites

North Lincolnshire Council utilises diffusion tubes for the measurement of both $NO_2$ and Benzene concentrations at a number of locations within the area.

### Nitrogen Dioxide ($NO_2$) Diffusion Tubes

The locations of the $NO_2$ diffusion tubes are represented in Figures 4 – 8 below.

### Figure 4 Scunthorpe $NO_2$ Tube Locations

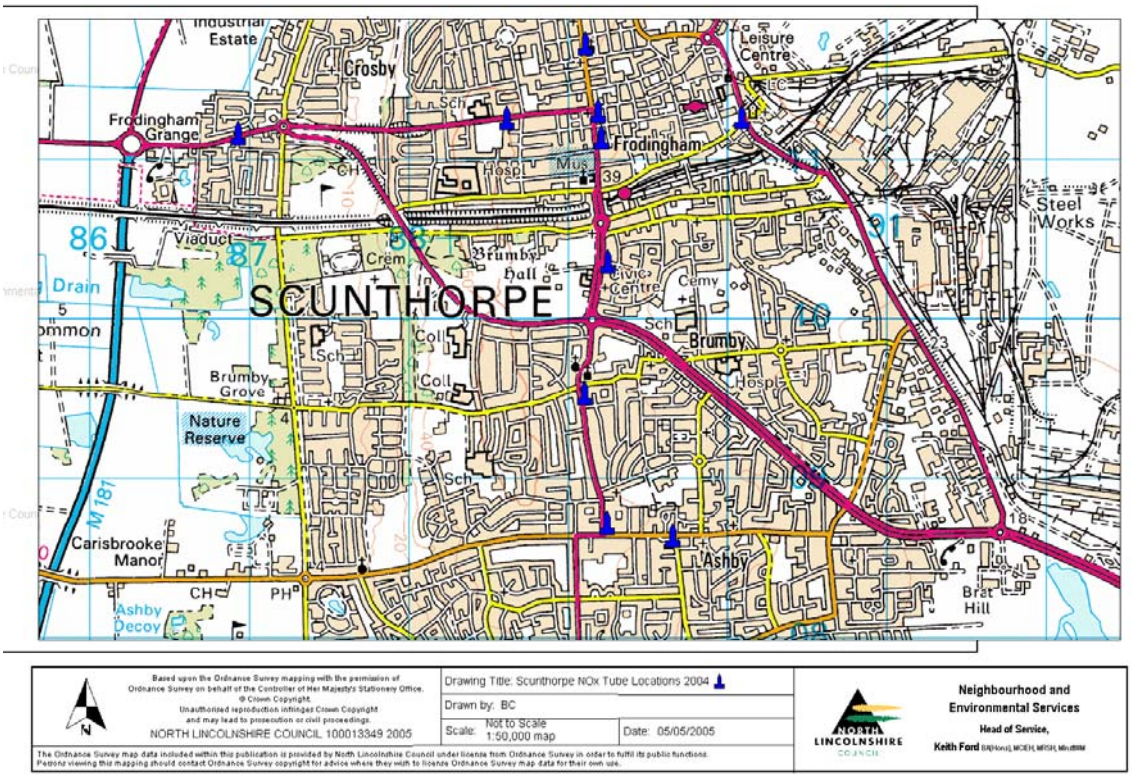


**Figure 5 Messingham $NO_2$ Tube Locations**

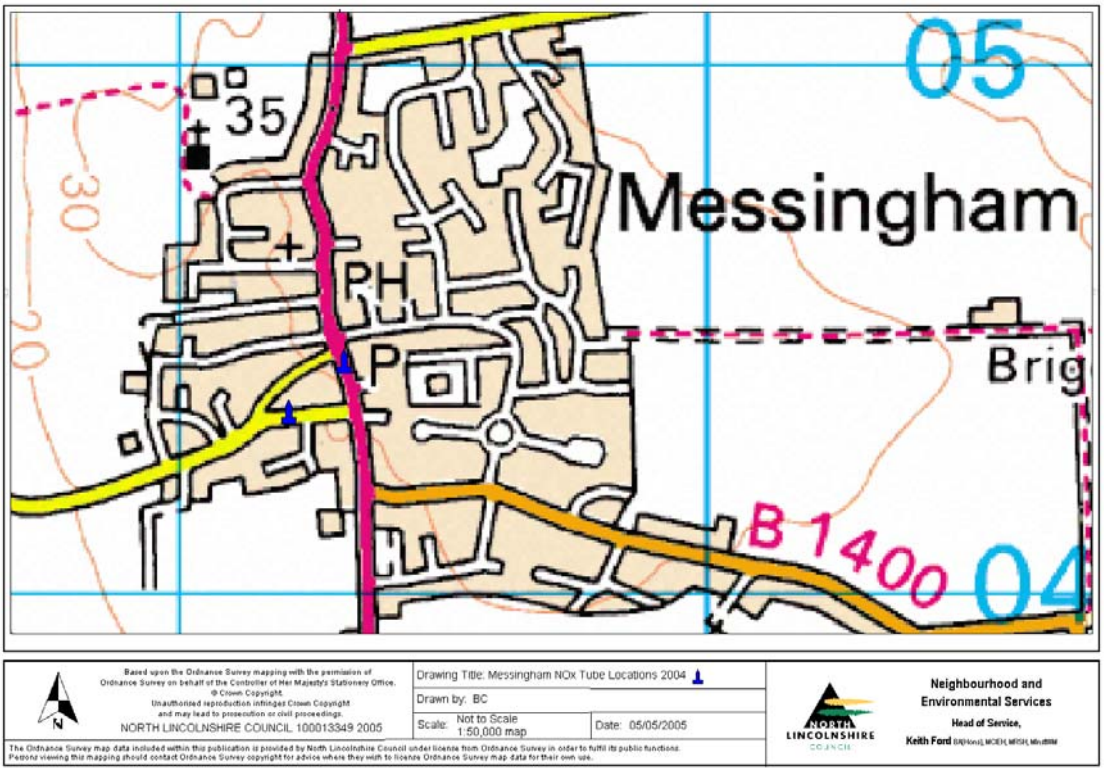



**Figure 6 Killinghome $NO_2$ Tube Locations**

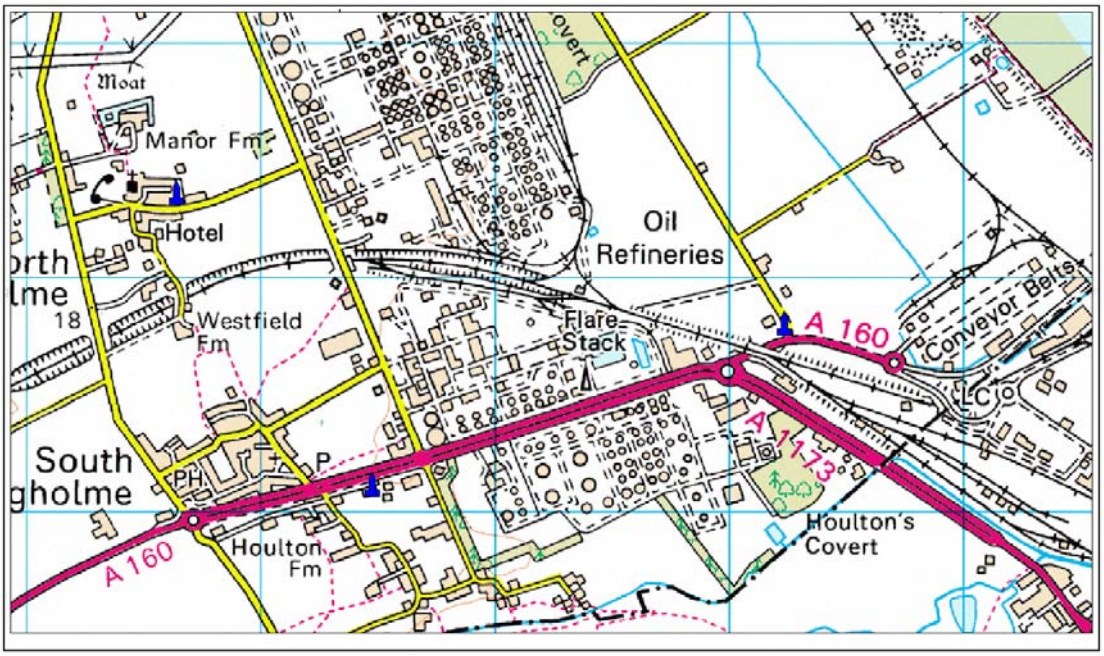


**Figure 7 Brigg $NO_2$ Tube Locations**

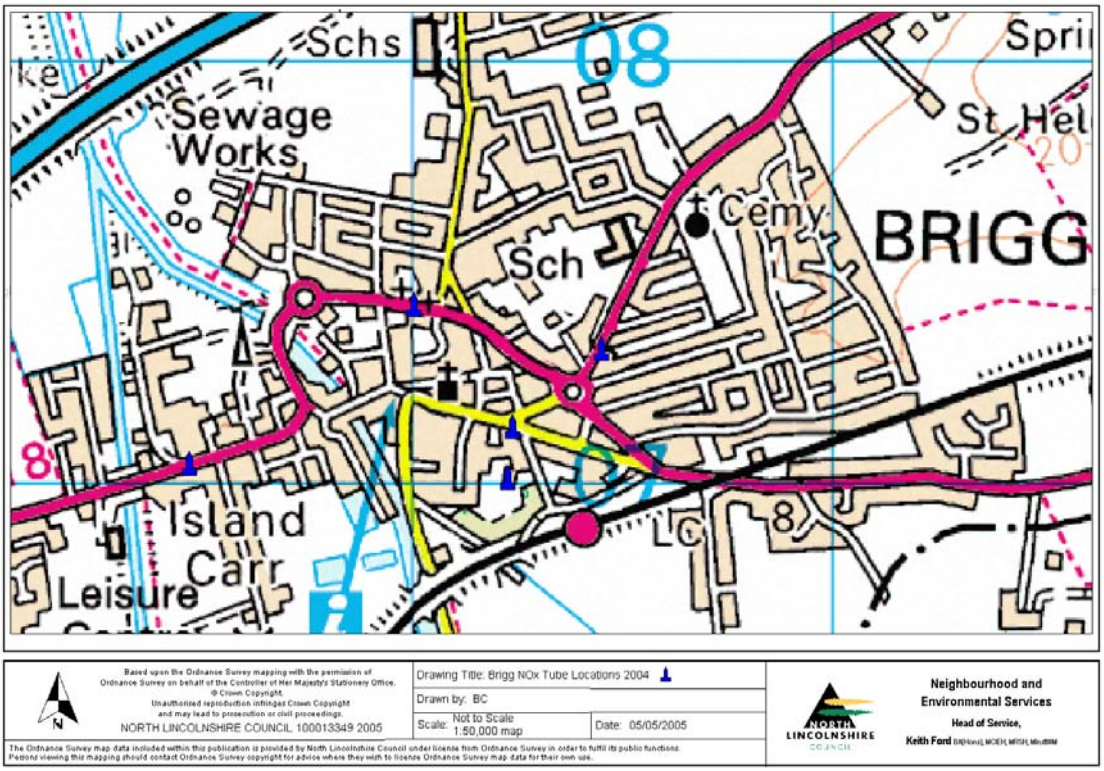
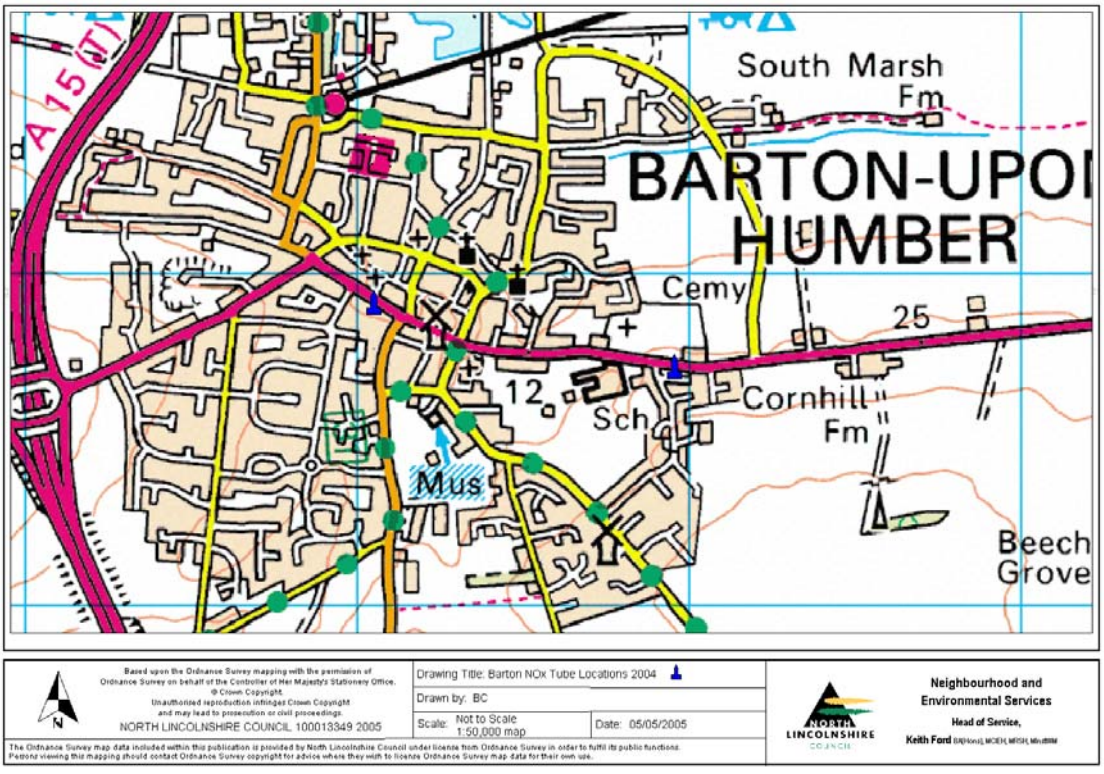



**Figure 8 Barton $NO_2$ Tube Locations**



$NO_2$ diffusion tubes are used to monitor emissions from road traffic. An annual review is conducted which considers data collected over the year and any changes to road traffic flows. Tubes are then relocated as required in accordance with DEFRA Technical Guidance LAQM.TG(03). New locations for 2004 are detailed in Table 10 Section 2.3.1.

**Benzene Diffusion Tubes**

Diffusion tubes measuring Benzene concentrations are located in the following areas:

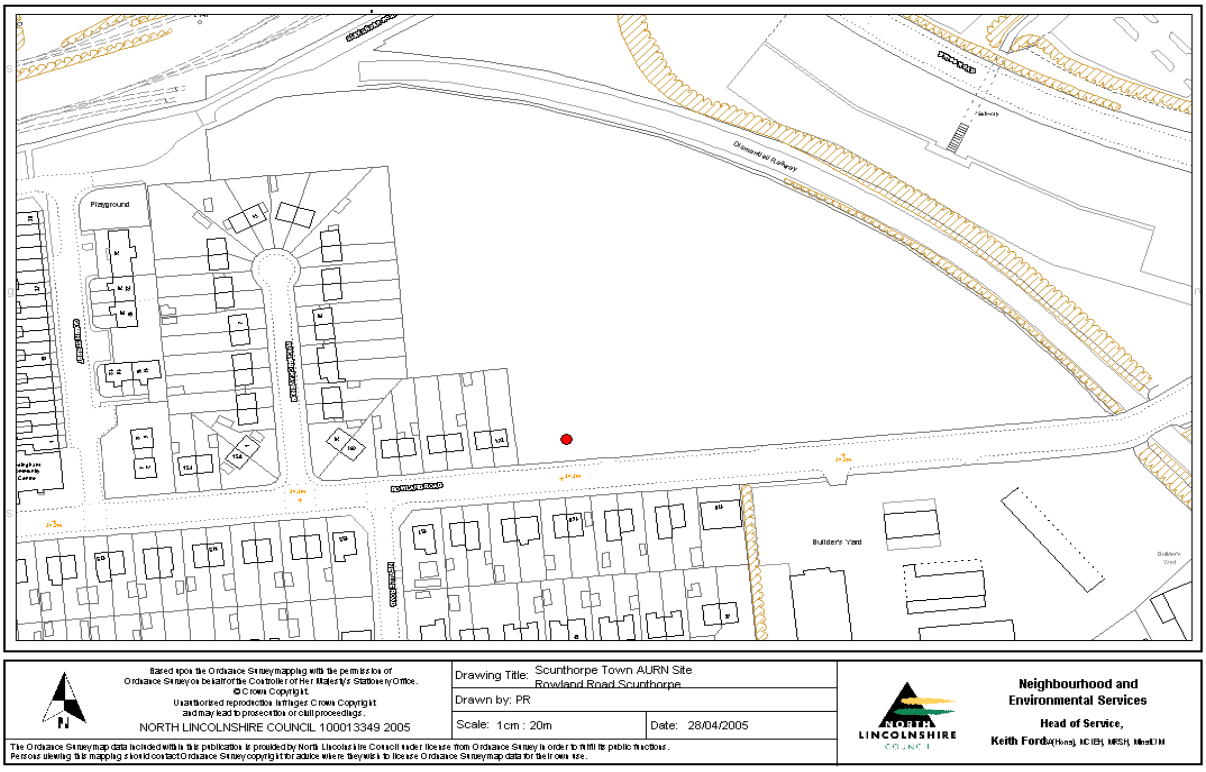
- Scunthorpe
- Killingholme

This survey was instigated as a result of the Updating and Screening Assessment, which identified the need to carry out a detailed assessment for Benzene resulting from industrial emissions.

More detailed location information is provided in Appendix 1 and 2.

### 2.1.3 Toxic Organic Micro Pollutants – TOMPS Network for PAH's

**Figure 9 Location of PAH Sampler**



The objective of the network is to monitor a range of toxic organic micropollutants at selected sites around the UK. PAH's are measured at 18 sites within the UK including Scunthorpe. The major source of PAH's in ambient air is from the incomplete combustion of carbon based fuels with industrial plant and vehicle emissions producing the largest quantities.

The high volume sampler is located at the site of the AURN station on Rowland Road due to its close proximity to the steelworks. It is in a location representative of exposure of the nearest residents, in accordance with DEFRA Technical Guidance LAQM.TG(03).

## 2.2 Benzene Detailed Assessment Update

The Updating & Screening Assessment (USA) for Air Quality produced by North Lincolnshire Council in May 2003 identified two areas within North Lincolnshire with the potential to exceed the 2010 air quality objective for benzene. The areas were:

- Scunthorpe
- Killingholme

Five IPPC installations operating within North Lincolnshire were identified for further consideration in the detailed assessment due to their annual mass emission of benzene. The significant sources of benzene are detailed in Table 4.

In the USA, the mass emission of benzene from each installation was compared against the nomograms for 2003 and 2010 respectively in accordance with Technical Guidance note LAQM TG(03). The nomograms estimate the distance from the source of benzene emission within which relevant receptors might be exposed to levels of benzene in excess of the 2010 objective.

In accordance with DEFRA Technical Guidance LAQM.TG(03) and with reference to Figure 10, sensitive dwellings in Scunthorpe located within a radius of 2000m from each coke oven battery may be exposed to levels above the objective, and similarly any sensitive dwelling within 400m from the Tar works.

Emissions of benzene from each installation were regarded as fugitive emissions because they are emitted at either a low level, low velocity or not from a source where emissions are fully contained and discharged through a stack. The zones of possible exceedence in Scunthorpe are identified in Fig 10.

In relation to Killingholme, the refineries are large-scale installations, with fugitive benzene emissions from the processing and storage of petroleum. As individual sources are difficult to pin point, sensitive dwellings up to 2000m from the installation boundary were considered to be within the area where a potential breach of the objective might occur. These dwellings are shown on Figure 11.

The sites identified are regulated by the Environment Agency under the Pollution Prevention and Control Act 1999 and under Integrated Pollution Control (IPC) as Part A processes. Reference to emissions inventory data for the years 2000, 2002 and 2003 is reproduced in Table 4.

**Figure 10 Location of Corus (UK) Ltd & Koppers Ltd**

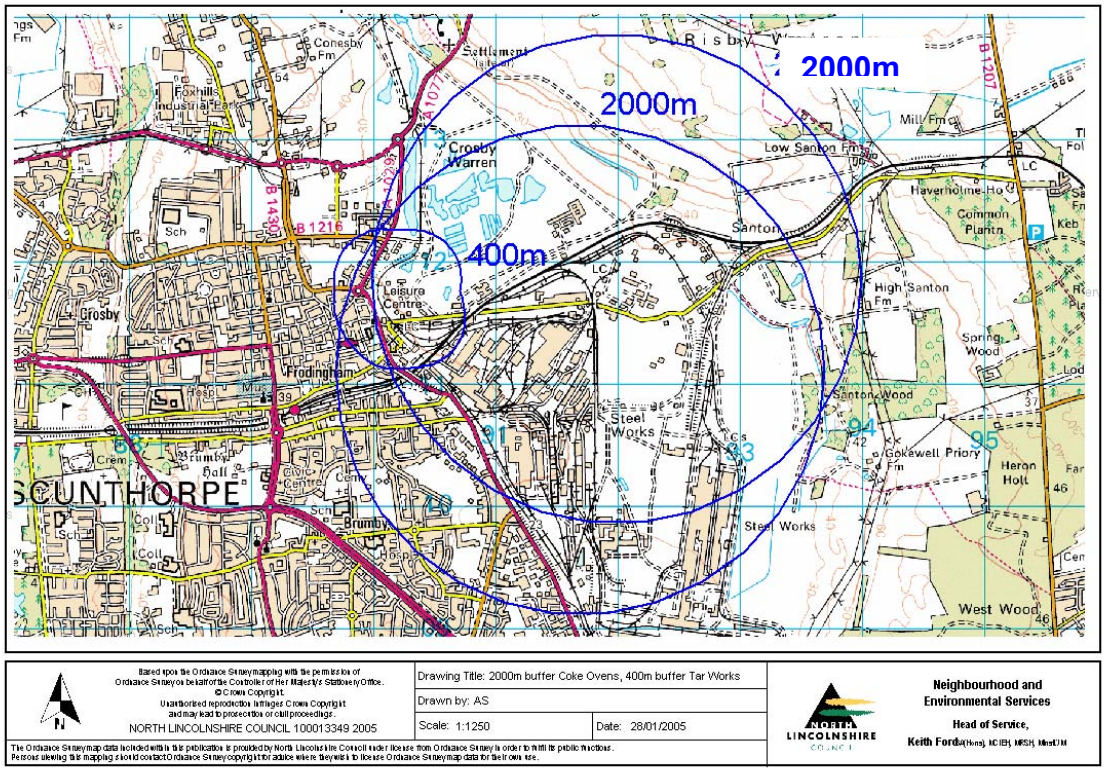



**Figure 11 Location of Conoco Phillips Ltd & Total UK Lindsey Oil**

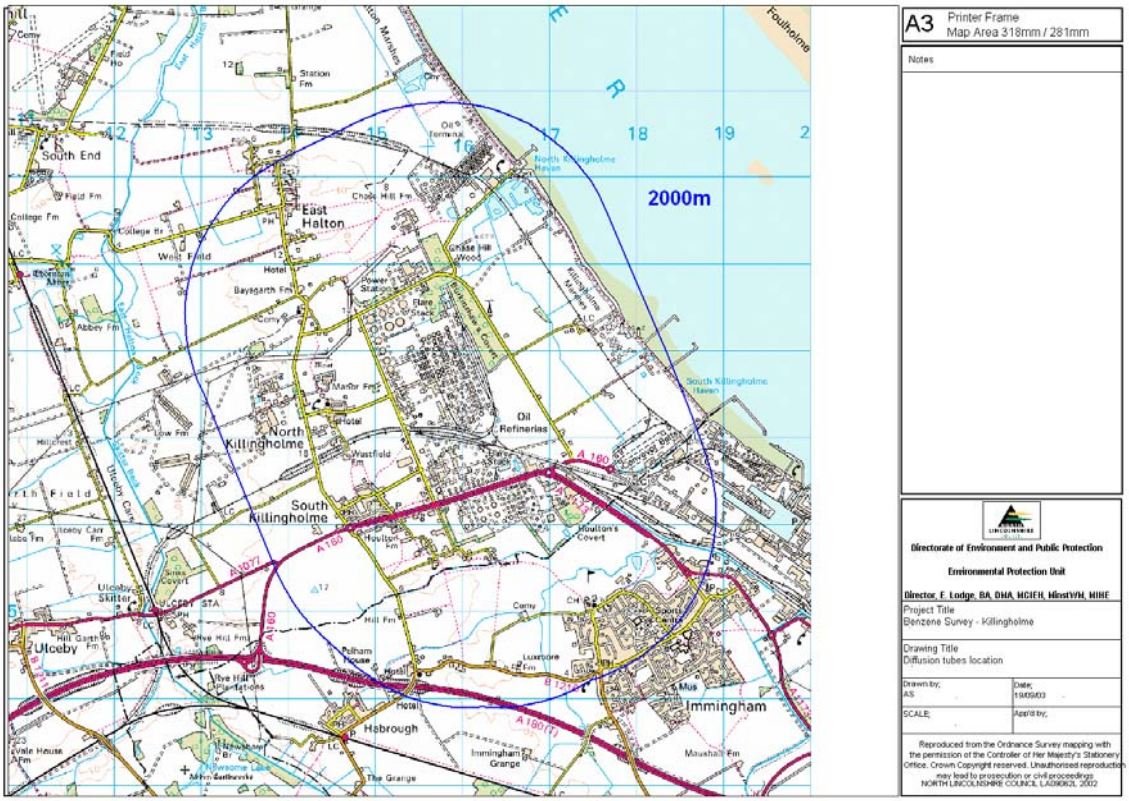


**Table 4 Data from the Environment Agency Pollution Inventory**

| Type of process | Operator | Auth Ref | Mass Emission (T) | | |
|---|---|---|---|---|---|
| | | | Year 2000 | Year 2002 | Year 2003 |
| Appleby Coke Ovens | Corus UK Ltd | AF7193 | 16 | 15.5 | 16.5 |
| Dawes Lane Coke Ovens | Corus UK Ltd | AF7193 | 16 | 15.5 | 16.5 |
| Tar/bitumen Distillation | Koppers Ltd | AU8296 | 1.45 | <1 | <1 |
| Petroleum Refinery | Conoco Phillips Ltd | AF8173 | 140 | 99 | 105 |
| Petroleum Refinery | Total UK Lindsey Oil | AF6928 | 91 | 88 | 76 |

In order to determine concentrations of benzene in ambient air at relevant locations a twelve-month monitoring program was undertaken. This commenced on 27th November 2003 and finished on 25th November 2004 in conjunction with Conoco Phillips Humber Refinery, Total UK Lindsey Oil Refinery and Koppers Ltd. A monitoring exercise was also undertaken to determine the concentration of benzene at the boundary of some of the installations. It was anticipated that these results would be used to measure benzene levels close to the installation and to determine the effect that distance from the source has on dispersion of benzene concentrations in ambient air.

The monitoring program consisted of 49 chromosorb diffusion tubes (plus one unexposed tube utilised as a control). Each tube was exposed for a period of one month; this was then repeated for a duration of 12 months. Each location was given an identification number 1-50 (50 being the control tube).

Where possible the tubes were attached to lampposts or the boundary fence of the nearby industrial installation. The chosen lampposts were sited as close as possible to relevant receptors, between 2 and 10m from residential dwellings. For the background measurement, the diffusion tube was situated approximately 320m away from the A18, greater than the minimum 100m from a major road recommended for background measurements.

The diffusion tubes were attached to the lampposts on metal brackets. The tubes were greater than 5cm away from the vertical surface of the lamppost. The tubes were mounted vertically with the sampling end downwards. All tubes with the exception of number 24 (lay-by on A180) were located at least 1.5m above ground, typically the tubes in residential areas were located out of arms reach, no tube was positioned greater than 2.5m above ground. Further information in relation to the sampling program is contained in Appendix 3.

### 2.2.1 Benzene Site Locations

**Scunthorpe** A total of 24 diffusion tubes were located in and around Scunthorpe at the following location types (see Appendix 1): -

| | |
|---|---|
| Relevant receptors in Scunthorpe | 14 |
| Relevant receptors in Santon village | 4 |
| Installation boundaries | 5 |
| Industrial and traffic | 1 |

Relevant exposure is defined in Technical Guidance LAQM.TG(03) as locations where members of the public (relevant receptors) are likely to be regularly present and are likely to be exposed over the averaging period of the objective (see Appendix 10).

In order to check the consistency of the measurement technique three diffusion tubes were co-located i.e. placed together at the same location. A co-location exercise was conducted at one boundary installation site and one relevant receptor site. It was anticipated that confidence in the results obtained would be improved if the co-located tubes showed consistent readings. Co-locations were chosen for areas where both low and high concentrations of benzene could be expected.

**Killingholme** A total of 23 diffusion tubes were located in the Killingholme area at the following location types (see Appendix 2):: -

| | |
|---|---|
| Relevant receptors in South Killingholme village | 6 |
| Relevant receptors in North Killingholme village | 4 |
| Relevant receptors in East Halton village | 2 |
| Refinery installation boundary | 10 |
| Relevant receptors to the west of the refineries | 1 |

As with the Scunthorpe survey three diffusion tubes were co-located at a relevant receptor and boundary location sites.

**Background** A diffusion tube was also located in Wrawby village near Brigg, this location was designed to represent background concentrations of benzene at relevant receptors when no major industrial or traffic sources exist to contribute to elevated levels of benzene.

**Traffic** A diffusion tube was also located on a lay-by on the A180, this was designed to quantify the extent to which road traffic contributes to measured values. The A180 is located a sufficient distance away from the refineries but has a similar traffic flow to the stretch of road close to the refinery.

### 2.2.2 Benzene Results

The results for the benzene survey are reproduced in Appendix 4 in ppb and Appendix 5 in ug/$m^3$. Results received from the laboratory were stated in ppb and the appropriate correction factor detailed in DEFRA guidance LAQM.TG(03) was applied for comparison with the air quality objective.

As previously detailed a number of tubes were co-located in order to check the consistency of the analytical technique. The results used for the calculation of the annual mean at co-location sites was the maximum monthly result from the 3 tubes exposed.

Some data was also excluded where the data from the exposed tube was equivalent to that measured by the control tube. Excluded data is highlighted in italics in Appendices 4 & 5.

**Scunthorpe**
With reference to Table 5, the majority of relevant receptor sites in and around Scunthorpe will achieve the 2010 annual mean air quality objective for benzene of 5$\mu g/m^3$.

However the results do identify a number of relevant receptors along Dawes Lane in Santon village (Tube 43,44 &45) that may be exposed to levels in excess of the 2010 objective.

The maximum monthly concentration of benzene recorded for co-located tubes 43,44 & 45 ranged between 1.43 - 6.50 $\mu g/m^3$ in Santon, with an annual mean of 3.39$\mu g/m^3$. Four of the monthly concentrations at this location were also above 4$\mu g/m^3$, these were observed in December 2003, January, February and November 2004. (See Appendix 5 for full results).

The annual mean concentrations of benzene recorded at the remaining locations in around Scunthorpe range between 1.08 - 2.74 $\mu g/m^3$ compared with a recorded general background concentration for benzene of 1.02$\mu g/m^3$ (tube 25).

With the exception of location numbers 29, 30 & 31 (co-located tubes at Queen St / Rowland Road) for the month of February 2004 only, and location number 46 in September 2004 no other relevant receptor sites exceeded a monthly benzene concentration of 4$\mu g/m^3$,. (See Appendix 5 for monthly tube concentrations).

The annual mean benzene concentrations for boundary sites detailed in Table 6 range from 1.91$\mu g/m^3$ – 2.61$\mu g/m^3$, at locations situated towards the West of the emissions source. The location in Santon Village (Collocated tubes 43,44,45) has been treated as a relevant receptor location although it could also be considered as an installation boundary location. As previously stated the maximum monthly concentration at this location was 6.50$\mu g/m^3$ (tube 43,44 & 45).

With effect from March 2005, monitoring for benzene at the site on Dawes Lane, Santon will continue for a period of 12 months to obtain further information regarding the potential for the 2010 objective of 5mg/m3 to be breached. Further screening has also identified a location at High Street East, Scunthorpe which may also have the potential to breach the 2010 objective. Monitoring will therefore also be carried out at this location for a period of 12 months.

In addition, information regarding the mass emissions from relevant installations will be reviewed annually, if there is a significant increase in the mass emission from any of the installations further monitoring will be undertaken at relevant receptors in Scunthorpe.

**Table 5 Scunthorpe Annual Mean at Relevant Receptors**

| Location Number | National Grid Ref | Location address | Annual Mean conc$^{n}$ of benzene $\mu g/m^3$ | % Data used |
|---|---|---|---|---|
| 29,30,31 | SE90141086 | Queens Street/Rowland Road. (LP 2) | 1.80 | 100 |
| 32 | SE 90011063 | Cottage Beck Road / Warwick Road (LP 23) | 1.93 | 100 |
| 33 | SE 89271053 | Cottage Beck Road/Ashby Road. (LP 1). | 1.89 | 100 |
| 34 | SE 89251035 | Ashby Road/Lydbrook (LP 9) | 1.57 | 100 |
| 35 | SE 89821033 | Cemetery Road/Fairmont Crescent (LP 1). | 1.37 | 75 |
| 36 | SE 90331013 | Warwick Road/Lilac Avenue (LP 5). | 1.39 | 92 |
| 37 | SE 90641001 | Lilac Avenue (LP 12) | 1.50 | 83 |
| 38 | SE 90540935 | Healey Road/Rutland Road (LP 17). | 1.08 | 67 |
| 40 | SE89641116 | Thompson Road/Station Road (LP 6). | 1.31 | 100 |
| 43,44,45 | SE92981195 | Dawes Lane, Santon, Nr Corus Barrier | 3.39 | 100 |
| 46 | SE 93541218 | Dawes Lane, Santon (LP 13) Opp House No. 32 | 2.09 | 92 |
| 47 | SE 89971170 | Trafford Street/Cross Street (LP 7). | 2.74 | 92 |
| 48 | SE 89781167 | Kings Court/Chapel Street (LP 37). | 1.65 | 92 |
| 49 | SE 89661155 | Crosby Road/Chapel Street (LP 2). | 1.55 | 92 |

**Table 6 Scunthorpe Annual Mean Concentration at Boundary Locations**

| Location Number | National Grid Ref | Location address | Annual Mean conc$^{n}$ of benzene $\mu g/m^3$ | % Data used |
|---|---|---|---|---|
| 26 | SE90591088 | Corus Boundary, Brigg Road/ Rowland Road. | 2.12 | 100 |
| 39 | SE91111003 | Corus Boundary, Brigg Road/Nr Grange Lane North (LP 90). | 2.31 | 100 |
| 41 | SE90091126 | Station Road/Brigg Road (LP 37) | 1.91 | 100 |
| 42 | SE90121152 | Koppers Boundary, High Street East/Dawes Lane (LP 6). | 2.61 | 100 |

**Table 7 Killingholme Annual Mean at Relevant Receptors**

| Location Number | National Grid Ref | Location address | Ann Mean benzene conc$^{n}$ $\mu g/m^3$ | % Data used |
|---|---|---|---|---|
| 1 | TA15941568 | Eastfield Road/Baptist Chapel Lane (LP 7). South Killingholme | 1.43 | 100 |
| 2 | TA15661563 | Faulding Lane/Baptist Chapel Lane (LP 27). South Killingholme | 1.36 | 92 |
| 5 | TA 15471610 | Humber Road (LP 59). South Killingholme | 1.46 | 100 |
| 6 | TA 15231602 | Primitive Chapel Lane/ Humber Road (LP 2). South Killingholme | 1.18 | 92 |
| 7 | TA 15131640 | Staple Road (LP 3). South Killingholme | 1.17 | 92 |
| 8 | TA 14621616 | Greengate Road (LP 3). South Killingholme | 1.11 | 83 |
| 9 | TA 14461721 | Clarkes Road (LP 3). North Killingholme | 0.86 | 92 |
| 10,11,12 | TA 14761730 | Nicholson Road (LP 3). North Killingholme | 1.36 | 100 |
| 16 | TA 14511879 | Brick Lane. East Halton | 1.46 | 100 |
| 17 | TA 14071899 | Scrub Lane (LP 6). East Halton | 1.07 | 100 |
| 19 | TA17321731 | Hazel Dene, Marsh Lane. South Killingholme | 2.09 | 92 |

**Killinghome**

With reference to Table 7, the results from the 12-month monitoring exercise suggest that the 2010 annual mean air quality objective of 5μg/m$^3$ for benzene is likely to be achieved at all relevant receptors in and around Killingholme.

The annual mean concentrations of benzene recorded range between 0.86 - 2.09 μg/m$^3$ compared with a recorded general background concentration for benzene of 1.02μg/m$^3$. No monthly benzene concentrations at relevant receptors exceeded 4μg/m$^3$, with the exception of location number 16 (Brick Lane, East Halton) in December 2003.

The annual means for boundary concentrations detailed in Table 8 for benzene range from 1.44μg/m$^3$ towards the Northern edge of the installations, to 6.54μg/m$^3$ towards the South-East of the installations.

The maximum monthly concentration at any boundary location was 14.30μg/m$^3$. Although this value was taken from a boundary location rather than a relevant receptor it is still less than the existing air quality objective for 2003 that allows an annual mean of 16.25μg/m$^3$.

It is concluded that there is no likelihood that the 2010 air quality objective for Benzene will be breached and therefore it is proposed that no further monitoring in the Killingholme area is undertaken unless there is a significant increase in the actual mass emission of benzene from any of the relevant installations in the locality.

**Table 8 Killingholme Annual Mean Concentration at Boundary Locations**

| Location Number | National Grid Ref | Location address | Annual Mean conc$^{n}$ of benzene μg/m$^{3}$ | % Data used |
|---|---|---|---|---|
| 3 | TA 15901585 | Eastfield Road, access track to Conoco. South Killingholme | 2.66 | 75 |
| 4 | TA 15731621 | Conoco Boundary, Humber Road/Eastfield Road Junction. South Killingholme | 3.57 | 100 |
| 13 | TA 15181747 | LOR Boundary, Eastfield Road/Nicholson Road. North Killingholme | 1.99 | 83 |
| 14 | TA 15041790 | LOR Boundary, Eastfield Road. North Killingholme | 2.69 | 92 |
| 15 | TA 14881835 | LOR Boundary, Chase Hill Road/Eastfield Road. North Killingholme | 1.44 | 100 |
| 18 | TA15561659 | Conoco Boundary, Eastfield Road/Staple Road (LP 16). South Killingholme | 3.95 | 100 |
| 20 | TA16301776 | LOR Boundary, Station Road/Rosper Road. South Killingholme | 3.02 | 83 |
| 21,22,23 | TA16811652 | Conoco Boundary, Pumping St. entrance, Humber Road. South Killingholme | 6.54 | 100 |

**Table 9 Background, Traffic & Control Tube**

| Location Number | National Grid Ref | Location address | Annual Mean conc$^{n}$ of benzene μg/m$^{3}$ | % Data used |
|---|---|---|---|---|
| 24 | TA10121334 | 3$^{rd}$ Layby A180 (W) | 1.06 | 67 |
| 25 | TA02370842 | Kettleby Lane, Wrawby, Nr Brigg | 1.02 | 100 |
| 50 | N/A | CONTROL not exposed to ambient air | 0.22 | 100 |

## 2.3 Nitrogen Dioxide – New Monitoring Data

### 2.3.1 Diffusion Tube Monitoring Data for Nitrogen Dioxide

At the end of each calendar year a review of the Nitrogen Dioxide ($NO_2$) diffusion tube data is undertaken to ensure that all tubes are sited in relevant locations, where members of the public are likely to be exposed for the averaging period of the objective. As diffusion tubes only obtain long-term monitoring data and can only be used to assess against the annual mean objective, all relevant locations in this case are residential dwellings. Traffic flows are reviewed and annual mean concentrations assessed. The tubes are exposed for a 4 or 5 week period throughout the year. Therefore, only the annual mean air quality objective of 40$\mu g/m^3$ can be assessed using this method as it is impossible to obtain short term monitoring data from them. Relevant locations for the annual mean objective are residential dwellings, therefore all the tubes are sited within 5m of the road, close to residential properties to monitor the worst case scenario.

Information regarding actual traffic flows is collated in accordance with the guidance for screening assessments contained in Technical Guidance LAQM.TG(03). Data is adjusted to estimate 2005 levels, using the correction factor given in Technical Guidance LAQM.TG(03) Box 6.6. Those tubes at locations considerably below (less than 36$\mu g/m^3$) the annual mean objective of 40$\mu g/m^3$ are discarded and tubes placed at new locations with the potential to breach the objective. New tube locations for 2004 are shown in Table 10 below.

Tubes at or above the annual mean objective of 40$\mu g/m^3$ are kept in position to obtain further data with a view to installing a continuous NOx analyser.

For locations where monitoring results are well below the objective (less than 36$\mu g/m^3$), no further adjustment is applied as it is considered that the risk of exceeding the annual mean objective is negligible.

**Table 10 New $NO_2$ Tube locations identified for 2004 from the traffic flow data and reference to GIS on proximity of sensitive receptors (residential dwellings):**

| Location | Village |
|---|---|
| Barrow Road | Barton on Humber |
| Bridge Street | Brigg |
| Ashby Road/Old Brumby Street | Scunthorpe |
| Ashby Road/Ashby High Street | Scunthorpe |
| Ashby Road | Scunthorpe |
| Oswald Road/Mary Street | Scunthorpe |
| Oswald Road | Scunthorpe |
| Britannia Corner/Oswald Road | Scunthorpe |
| Frodingham Road | Scunthorpe |
| Ashby High Street/Bottesford Road | Scunthorpe |

| | |
|---|---|
| Doncaster Road/Henderson Avenue | Scunthorpe |
| Doncaster Road/Hilton Avenue | Scunthorpe |
| Messingham High Street | Messingham |
| Messingham Butterwick Road | Messingham |
| Doncaster Road, Nr Tescos | Scunthorpe |
| Queensway/Fardell Road Junction | Scunthorpe |
| S Killingholme Primary School (3 tubes re-located with chemiluminescent analyser) | South Killingholme |

Table 11 below details summary results for the sites monitored during 2004, the full results are contained in Appendix 6. The sites that are likely to exceed the air quality objectives for 2005 are identified in bold. The information is also presented graphically in Figure 12.

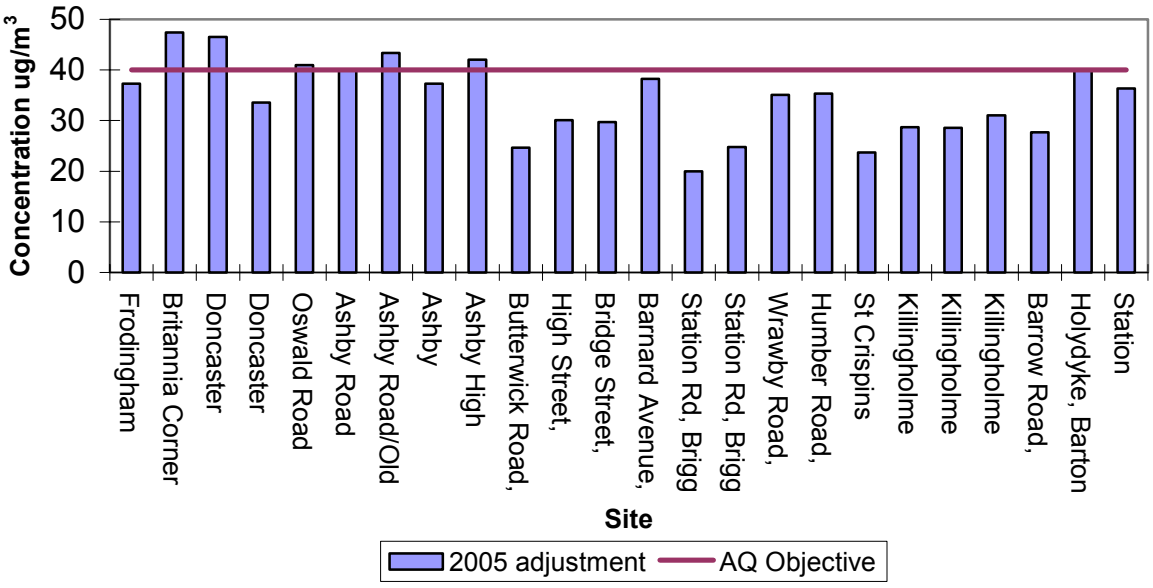
**Table 11 Nitrogen Dioxide Diffusion Tube Survey Results showing Potential Exceedance of $NO_2$ Annual Mean Objective**

| Location | National Grid Ref | Site Type | 2004 | 2005 |
|---|---|---|---|---|
| Frodingham Road, Scunthorpe | SE8910711726 | Kerbside | 38 | 37 |
| **Britannia Corner, Scunthorpe** | SE8918911306 | Kerbside | **49** | **47** |
| **Doncaster Rd/ Hilton Ave, Scunthorpe** | SE8693011160 | Kerbside | **48** | **47** |
| Doncaster Rd/ Henderson Ave, Scunthorpe | SE8861611256 | Kerbside | 34 | 34 |
| **Oswald Road, Scunthorpe** | SE8920811136 | Kerbside | **42** | **41** |
| **Ashby Road, Scunthorpe** | SE8924610355 | Kerbside | **41** | **40** |
| **Ashby Road/ Old Brumby St, Scunthorpe** | SE8910009531 | Kerbside | **45** | **43** |
| Ashby Rd/ Ashby High St, Scunthorpe | SE8924308712 | Kerbside | 38 | 37 |
| **Ashby High St/ Bottesford Rd, Scunthorpe** | SE8965808658 | Kerbside | **43** | **42** |
| Butterwick Road, Messingham | SE8920904337 | Kerbside | 25 | 25 |
| High St, Messingham | SE8931404432 | Kerbside | 31 | 30 |
| Bridge St, Brigg | SE9947507039 | Kerbside | 30 | 30 |
| Barnard Ave, Brigg | TA0000907419 | Kerbside | 39 | 38 |
| Station Rd, Brigg / Hewson House Background | TA0023307008 | Kerbside | 21 | 20 |
| Station Rd, Brigg / Hewson House Roadside | TA0024307130 | Kerbside | 25 | 25 |

| | | | | |
|---|---|---|---|---|
| Wrawby Rd,Brigg | TA0045507314 | Kerbside | 36 | 35 |
| Humber Rd, South Killinghome | TA1548016117 | Kerbside | 36 | 35 |
| St Crispins Close, South Killingholme | TA1464317364 | Kerbside | 24 | 24 |
| Killingholme Primary School | TA1488016120 | Kerbside | 29 | 29 |
| Killingholme Primary School | TA1488016120 | Kerbside | 29 | 29 |
| Killingholme Primary School | TA1488016120 | Kerbside | 32 | 31 |
| Barrow Rd, Barton | TA0396021710 | Kerbside | 28 | 28 |
| **Holydyke, Barton** | TA0305221907 | Roadside | **41** | **40** |
| Station Rd,/ Brigg Rd, Scunthorpe | SE9009011263 | Kerbside | 37 | 36 |

[1] – estimated annual mean using correction factors detailed in Box 6.6 of Technical Guidance LAQM. TG(03).

**Figure 12 Annual Mean $NO_2$ Concentrations predicted to 2005**




**Britannia Corner, Scunthorpe**

Although the tube located at Britannia Corner has shown an annual mean in excess of the objective of 40μg/m$^3$, as part of North Lincolnshire's first round Air Quality Review and Assessment – Stage Three Report, the area covering Britannia Corner was specifically modelled to assess likely compliance with the 2005 objectives. The modelling exercise concluded, "this area should be viewed as being at little risk of exceeding the annual mean air quality objective 2005." It was also noted that there was no relevant exposure to members of the public at

those points where there was a risk of exceedence as there were no residential dwellings. This situation remains the same and consequently, the conclusion of the modelling report remains valid.

**Doncaster Rd/ Hilton Ave, Scunthorpe**

Data gathered in 2004 identified that data from the Doncaster Road/Hilton Avenue kerbside tube was consistently higher than the 2005 annual mean objective. Although this is a kerbside site, there are residential dwellings located a small distance away that might potentially be affected.

Analysis of the monthly tube data identifies that the August result for this location looks unusually low compared to the rest of the year consequently this has been discounted. When this value is removed from the results, it gives an annual mean of 50 $\mu g/m^3$, which is considerably above the objective level of 40$\mu g/m^3$.

A chemiluminescent NOx analyser is currently being installed at this location in line with the façade of the nearest dwellings in order to obtain continuous monitoring data.

**Oswald Road, Scunthorpe**

The Oswald Road tube is predicted to be marginally above the 2005 annual mean objective of 40$\mu g/m^3$. This tube has therefore been left in situ in order to gain further data in 2005.

**Ashby Road, Ashby Road/ Old Brumby St, Scunthorpe**

The Ashby Road tubes have all exceeded the 2005 annual mean objective of 40$\mu g/m^3$ in 2004. Additional tubes have therefore been located along Ashby Road as there is the potential for breaches of both the 1-hour and annual mean objective. Also due to the extent of possible breaches a chemiluminescent NOx analyser is currently being installed in order to obtain continuous monitoring data. This is to be located next to the dwellings at the point considered to be the worst-case scenario.

**Ashby High St/ Bottesford Rd, Scunthorpe**

The Ashby High Street/Bottesford Road tube is slightly above the 2005 annual mean objective of 40$\mu g/m^3$ however with regard to the annual mean objective there are no relevant receptors at this location.

As it is only marginally above the 2005 annual mean objective it is considered unlikely that the 1-hour objective would be breached even though it should be considered a relevant location for review and assessment purposes.

**Holydyke, Barton**

The Holydyke, Barton tube is predicted to be at the 2005 annual mean objective of 40μg/m$^3$. This tube has therefore been left in situ in order to gain further data in 2005.

## Co-location of Nitrogen Dioxide Diffusion Tubes

The co-location studies undertaken by North Lincolnshire Council did not yield a high enough data capture to determine a bias adjustment factor. There are also no bias adjustment factors available as yet on the Air Quality Review and Assessment website at http://www.uwe.ac.uk/aqm/review. Therefore the above estimates for 2005 have not been bias adjusted in accordance with Box 6.3 of Technical Guidance LAQM.TG(03). A co-location study is currently being undertaken at the continuous analyser located on Rowland Road, Scunthorpe, the results of which will be used in further reviews.

The reductions in nitrogen dioxide estimated for 2005, although showing likely exceedences of the annual means, arise from the likely reduction in road traffic emissions in future years.

## 2.3.2 Automatic Monitoring Sites for Nitrogen Dioxide 2004

Automatic continuous monitoring for Nitrogen Dioxide has been carried out at the locations listed in Table 12 below. This data can be used to assess both the annual mean objective of 40 μg/m$^3$ and the 1 hour mean objective of 200μg/m$^3$ not to be exceeded more than 18 times a year. The results are shown in Table 12.

**Table 12 Automatic Monitoring Sites for Nitrogen Dioxide 2004**

| Site Name | National Grid Reference | Data Capture | Annual Mean Conc$^n$ (μg/m$^3$) 2004 | Predicted Annual Mean Conc$^n$ (μg/m$^3$) 2005 | No. of Exceedences of 1-Hour Mean Conc$^n$ of 200μg/m$^3$ or 99.8$^{th}$ percentile of hourly means |
|---|---|---|---|---|---|
| ***Rowland Rd, Scunthorpe** | SE9031010830 | 2004 = 53.0%<br>Period = 93% | 23 | 22.5 | 93.4(C) |
| **Killingholme Primary School, Sth Killingholme** | TA1488016120 | 99.6% | 25 | 24.5 | 0 (E) |
| **Station Rd, Keadby** | SE8359611076 | 81.3% | 18 | 17.5 | 69 (C) |

- Site commenced on 6$^{th}$ June 2004.

In accordance with Technical Guidance LAQM.TG(03) data should meet certain criteria with respect to data capture. In order to estimate the number of exceedences of the air quality objectives for $NO_2$ a minimum of 90% data capture is required, if 90% data capture has not been achieved the appropriate percentile concentration value should be stated rather than the actual number of exceedences. Values in Table 12 suffixed by (E) detail the actual number of exceedences whereas values suffixed by (C) represent percentile values that should be compared with the actual air quality objective concentration value.

From the continuous monitoring data the Council is satisfied that the Air Quality Objectives for the annual mean and the 1-Hour mean for nitrogen dioxide are unlikely to be exceeded in 2005 in any of the above locations.

Continuous analysers are to be located at Doncaster Road/Hilton Avenue and on Ashby Road, to obtain more accurate data regarding the annual mean objective of 40$\mu g/m^3$. This data will also be used to assess these locations with regard to the 1 hour mean objective of 200$\mu g/m^3$ not to be exceeded more than 18 times a year.

## 2.4 Sulphur Dioxide - New Monitoring Data

### 2.4.1 Sulphur Dioxide Detailed Assessment Update - Keadby

The Updating and Screening Assessment (USA) conducted in May 2003 applied the screening tool in LAQM.TG(03) (par.7.27) which considers the number of solid fuel burning dwellings within a set area. The USA identified that the village of Keadby required a detailed assessment in relation to sulphur dioxide.

The data gathered during the 2004 monitoring exercise at Keadby detailed in Table 13 does not exceed any of the 2004 or 2005 air quality objectives for sulphur dioxide. There is no need to declare an air quality management area for sulphur dioxide in Keadby**.**

### 2.4.2 Automatic Monitoring Sites for Sulphur Dioxide – 2004

**Table 13 Automatic Monitoring Sites for Sulphur Dioxide 2004**

| Site Name | National Grid Reference | Data Capture | No. of Exceedences of 15 Min Mean Conc$^{n}$ of 266μg/m$^{3}$ or 99.9$^{th}$ percentile of hourly means | No. of Exceedences of 1-Hour Mean Conc$^{n}$ of 350μg/m$^{3}$ or 99.7$^{th}$ percentile of hourly means | No. of Exceedences of 24-Hour Mean Conc$^{n}$ of 125μg/m$^{3}$ or 99$^{th}$ percentile of hourly means |
|---|---|---|---|---|---|
| ***Cottage Beck Road, Scunthorpe** | SE905551 0674 | 2004 = 20.0% Period = 96% | 149(C) | 121(C) | 59(C) |
| ****Rowland Rd, Scunthorpe** | SE903101 0830 | 2004 = 54.0% Period = 95% | 146(C) | 106(C) | 53(C) |
| **Killingholme Primary School, Sth Killingholme** | TA148801 6120 | 99.5% | 0(E) | 0(E) | 0(E) |
| **Station Rd, Keadby** | SE835961 1076 | 87% | 2(E) 133(C) | 0(E) 79(C) | 0(E) 13(C) |

*Site terminated on 17th March 2004 ** Site commenced on 6th June 2004.

For locations of sites please see Figures 1, 2 and 3.

In accordance with Technical Guidance LAQM.TG(03) data should meet certain criteria with respect to data capture. In order to estimate the number of exceedences of the 2004 air quality objectives for $SO_2$ a minimum of 90% data capture is required, if 90% data capture has not been achieved the appropriate percentile concentration value should be stated rather than the actual number of exceedences. Values in Table 13 suffixed by (E) detail the actual number of exceedences whereas values suffixed by (C) represent percentile values that should be compared with the actual air quality objective concentration value.

To investigate ambient air quality in the vicinity of the Corus integrated Steelworks in Scunthorpe a monitoring station was placed at North Lincolnshire Neighbourhood & Environmental Services Depot on Cottage Beck Road NGR SE9055510674 at the end of 1997. The site was reviewed at the end of 2003 and the location was not considered to be a relevant location in accordance with the Technical Guidance LAQM.TG(03) as there were no relevant receptors (see Appendix 10). Consequently during 2004 the site was relocated to more accurately reflect exposure of the local population, the site is now located on the green open space close to residential dwellings on the corner of Rowland Road and Brigg Road NGR SE9031010830.

Unfortunately, because of the relocation, the data for Scunthorpe does not meet the minimum requirements in relation to data capture, however data capture figures have been provided based on the calendar year and the monitoring period. This shows that whilst there was a gap in monitoring data during the months of March to June 2004, data capture at the two sites resulting in annual data capture of 20% and 54% respectively, data capture over the monitoring period was reasonably good at 96% and 95% respectively.

From the continuous monitoring data the authority is satisfied that all the Air Quality Objectives for sulphur dioxide are unlikely to be exceeded in any of the above locations.

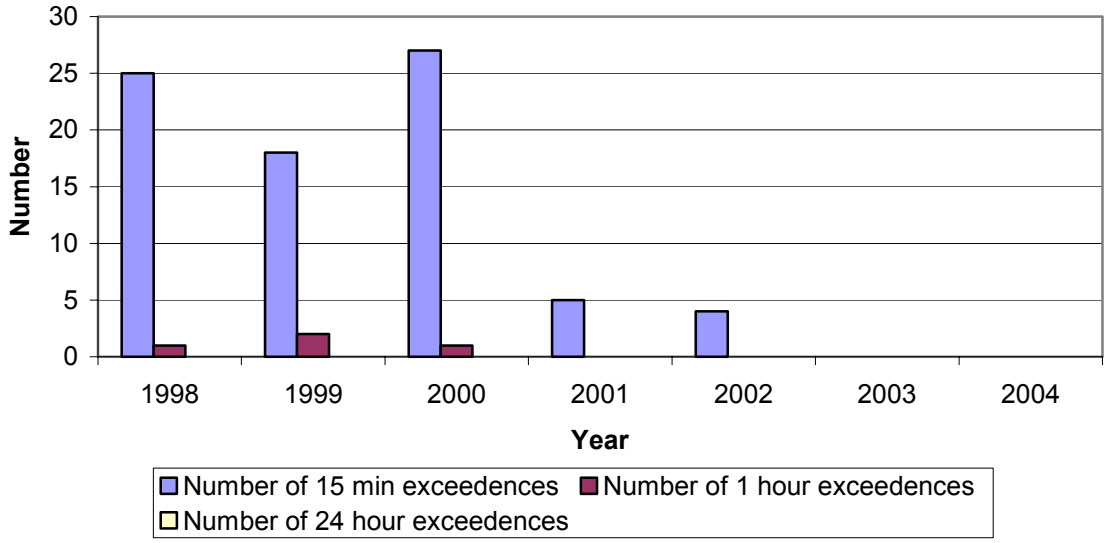
### 2.4.3 Automatic Monitoring Sites for Sulphur Dioxide – Historical Data

Data from the Cottage Beck Road site in Scunthorpe is available for a number of years and shows a steady decline in the number of exceedences of the air quality objectives for sulphur dioxide in Scunthorpe. Tabular and graphical representations of this data can be found in Table 14 & Figure 13.

**Table 14 Historical Monitoring Data for Sulphur Dioxide**

| Period | No. of Exceedences of 15 Mln Mean of 266μg/m$^3$ | No. of Exceedences of 1-Hr Mean 350μg/m$^3$ | No. of Exceedences of 24-Hr Mean 125μg/m$^3$ |
|---|---|---|---|
| 1998 | 25 | 1 | 0 |
| 1999 | 18 | 2 | 0 |
| 2000 | 27 | 1 | 0 |
| 2001 | 5 | 0 | 0 |
| 2002 | 4 | 0 | 0 |
| 2003 | 0 | 0 | 0 |
| 2004 | 0 | 0 | 0 |

**Figure 13 Number of Exceedences of AQ Objectives for $SO_2$ - Scunthorpe**



## 2.5 Particulate Matter $PM_{10}$ - New Monitoring Data

### 2.5.1 Particulate Matter $PM_{10}$ Detailed Assessment Update - Keadby

The Updating and Screening Assessment (USA) conducted in May 2003 applied the screening tool in LAQM.TG(03) (par.7.27) which considers the number of solid fuel burning dwellings within a set area. The USA identified that the village of Keadby required a detailed assessment in relation to Particulate Matter.

The data gathered during the 2004 monitoring exercise at Keadby detailed in Table 15 does not exceed either the 24 hour mean or annual mean air quality objectives for Particulate Matter. There is no need to declare an air quality management area for Particulate Matter in Keadby**.**

### 2.5.2 Automatic Monitoring Sites for Particulate Matter $PM_{10}$ – 2004

**Table 15 Automatic Monitoring Sites for $PM_{10}$ 2004**

| Site Name | National Grid Reference | Data Capture | Annual Mean 2004 ($\mu g/m^3$ grav) | Predicted Annual Mean 2010 ($\mu g/m^3$ grav) | No. of Exceedences of 24-Hour Mean Concentration of $50\mu g/m^3$ or $90^{th}$ percentile of daily means |
|---|---|---|---|---|---|
| ***Cottage Beck Road, Scunthorpe** | SE9055510674 | 2004 = 20.0% Period = 97% | Period Mean 32 (C) | 28 (C) | 6 (E)<br>46 (C) |
| ****Rowland Rd, Scunthorpe** | SE9031010830 | 2004 = 54.0% Period = 95% | Period Mean 27 (C) | 24 (C) | 24 (E)<br>52 (C) |
| **Amalgamated Scunthorpe Data** | SE9031010830 | 75% | 27 (C) | 24 (C) | 56 (C) |
| **Killingholme Primary School, Sth Killingholme** | TA1488016120 | 86.9% | 24(C) | 21(C) | 34(C) |
| **Station Rd, Keadby** | SE8359611076 | 90% | 21(C) | 18(C) | 1(E) |

*Monitoring period 1st January 2004 - 17th March 2004

** Monitoring Period 6th June 2004 – 31st December 2004.

In accordance with Technical Guidance LAQM.TG(03) data should meet certain criteria with respect the data capture. In order to calculate an annual mean a minimum of 9 months data is required. To estimate the number of exceedences of the daily mean air quality objective for $PM_{10}$ a minimum of 90% data capture is required, if 90% data capture has not been achieved that the 90$^{th}$ percentile concentration value should be stated rather than the number of exceedences.

Values in Table 15 suffixed by (E) detail the actual number of exceedences whereas values suffixed by (C) represent percentile values that should be compared with the actual air quality objective concentration value.

## Scunthorpe $PM_{10}$

To investigate ambient air quality in the vicinity of the Corus integrated steelworks in Scunthorpe a monitoring station was placed at North Lincolnshire Council's Neighbourhood & Environmental Services Depot on Cottage Beck Road NGR SE9055510674 at the end of 1997. The site was reviewed at the end of 2003 and the location was not considered to be a relevant location in accordance with the Technical Guidance LAQM.TG(03) as there were no relevant receptors (see Appendix 10). Consequently during 2004 the site was relocated to more accurately reflect exposure of the local population, the site is now located on the green open space close to residential dwellings on the corner of Rowland Road and Brigg Road NGR SE9031010830.

Unfortunately because of the relocation the data for Scunthorpe does not meet the minimum requirements in relation to data capture, however data capture figures have been provided based on both the calendar year and the monitoring period. This shows that whilst there was a gap in monitoring data during the months of March to June 2004, annual data capture at the two sites was 20% and 54% respectively, however data capture over the monitoring period was reasonably good at 97% and 95% respectively.

As in previous years, Scunthorpe is likely to meet the 2004 annual mean air quality objective for $PM_{10}$ of 40$\mu g/m^3$, however it very likely to exceed the provisional annual mean objective proposed for 2010.

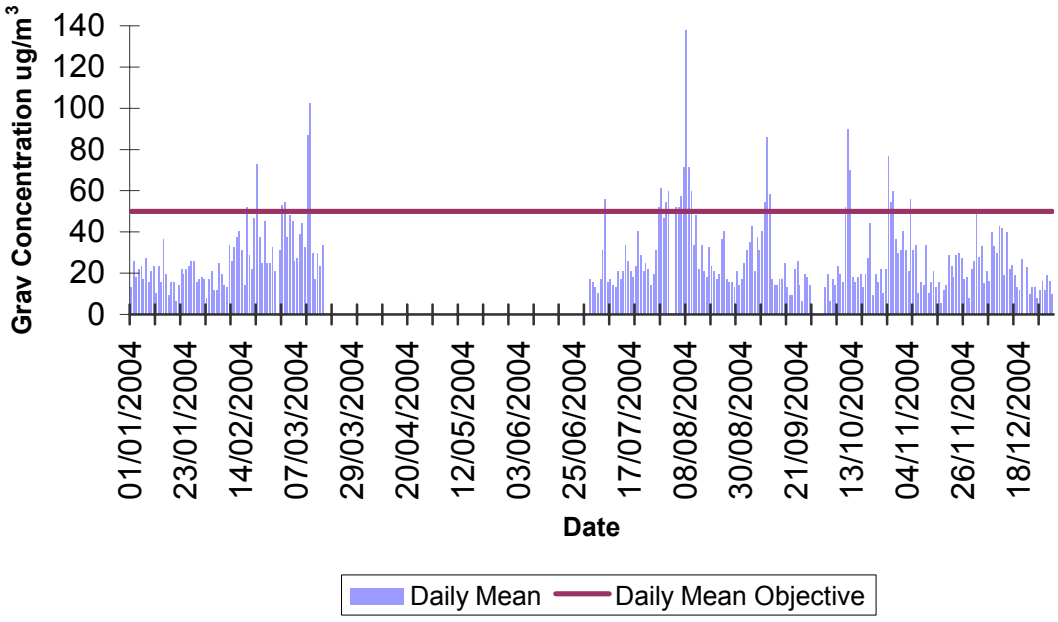
In relation to the number of exceedences of the daily mean air quality objective for $PM_{10}$ it was concluded in the Detailed Assessment published in April 2004 that an Air Quality Management Area would need to be declared in Scunthorpe.

Data for 2004 confirms this view with the Cottage Beck Road and Rowland Road sites recording 6 and 24 exceedences respectively. Due to data capture requirements it is necessary to consider the 90$^{th}$ percentile concentration value of daily means for comparison with the air quality objective. Whilst Cottage Beck Road recorded a 90$^{th}$ percentile value of 46ug/m$^3$ Rowland Road recorded a value of 52ug/m$^3$, this can then be compared with the 24 hour mean objective

value of 50ug/$m^3$. The data at the Cottage Beck Road site does not in fact breach the objective over the period however data was collected during the winter season when less exceedences would be expected.

Due to the close proximity of the two sites after relocation the Scunthorpe data has also been presented for 2004 as one data set. Data capture overall for 2004 was 75%, the two sites recorded a combined total of 30 exceedences over approximately 9 months, Scunthorpe is likely therefore to continue to breach the daily mean air quality objective for $PM_{10}$. The gravimetric daily mean concentrations for Scunthorpe for 2004 are detailed in Figure 14.

**Figure 14 Gravimetric Daily Mean $PM_{10}$ – Scunthorpe 2004**




## 2.5.3 Automatic Monitoring Sites for $PM_{10}$ – Historical Data

Data from the Cottage Beck Road site in Scunthorpe is available for a number of years and is detailed in Table 16. It shows quite a variation in the number of exceedences of the daily mean air quality objective and the annual mean for $PM_{10}$ in Scunthorpe. The data is shown graphically in Figures 15 and 16 respectively.

**Table 16 Historical $PM_{10}$ Concentrations Recorded at Scunthorpe**

| Site | Period | Ann Mean | Predicted 2004 (µg/m$^3$ grav) | Predicted 2010 (µg/m$^3$ grav) | No. of Exceedences of 24-Hr Mean 50µg/m$^3$ grav |
|---|---|---|---|---|---|
| Cottage Beck Road | 2000 | 27 (C) | 23 (C) | 20 (C) | 33 (E) |
| Cottage Beck Road | 2001 | 32 (C) | 30 (C) | 26 (C) | 51 (E) |
| Cottage Beck Road | 2002 | 25 (C) | 31 (C) | 27 (C) | 48 (E) |
| Cottage Beck Road | 2003 | 39 (C) | 38.5 (C) | 35 (C) | 95(E) |
| Cottage Beck Road/Rowland Road | 2004 Amalgamated | 27 (C) | N/A | 24 (C) | 56 (C) |

**Figure 15 Number of Exceedences of 24 Hour Mean AQ Objective for $PM_{10}$ Scunthorpe**

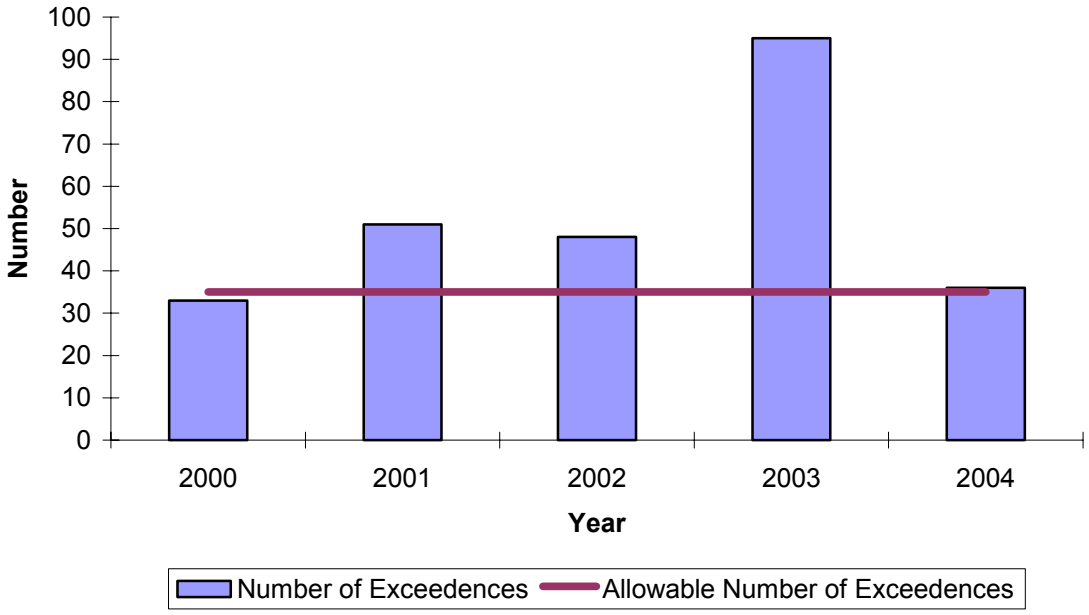
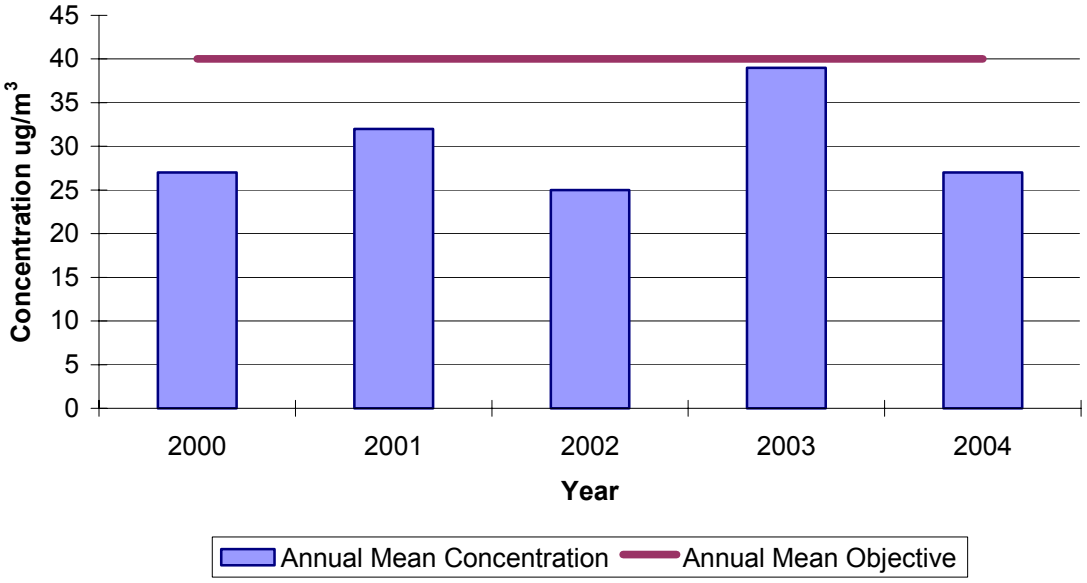


**Figure 16 Annual Mean $PM_{10}$ Concentration Scunthorpe**



## 2.6 PAH'S

### 2.6.1 PAH's - New Monitoring Data

The European Commission and European Parliament are currently debating the text of the 4th Air Quality Daughter Directive (4DD), which amongst other pollutants sets a target value for benzo(a)pyrene as an indicator for PAH's. The target value indicator is 1 ng/$m^3$ as an annual average; this value must not be exceeded in three or more years in any five-year period.

**Table 17 Annual mean PAH concentrations in Scunthorpe**

| | 1999 | 2000 | 2001 | 2002 | 2003 |
|---|---|---|---|---|---|
| **Annual PAH concentration ng/$m^3$** | 0.37 | 1.2 | 0.34 | 1.4 | 1.3 |

From the data presented in Table 17 it should be noted that Scunthorpe is likely to breach the value in the 4th Air Quality Daughter Directive. This value has not yet been transposed into UK legislation, but will probably require continued monitoring and further assessment in the future.

# 3.0 New Developments – Industrial Processes

This progress report addresses developments that may impact on local air quality. This includes new Part A1, A2 and Part B processes permitted under the Integrated Pollution Prevention and Control Act 1999. It is also important to consider any permitted processes with substantially changed emissions, new landfill sites or quarries with relevant public exposure where planning permission has been granted.

## 3.1 Part A1 Industrial Processes

North Lincolnshire has a significant number of Part A processes within its area. With reference to Appendix 2 of Technical Guidance LAQM.TG(03) no new or significantly varied processes have been identified. Processes transferring from IPC to IPPC have previously been assessed in the Updating and Screening Assessment.

## 3.2 Part A2 Industrial Processes

Although a number of processes have transferred under the Integrated Pollution and Prevention and Control Act 1999 from the Part B regime to become Part A2 processes, they were previously assessed in the Updating and Screening Assessment.

Current A2 processes are
William Blyth Ltd
Bemis Packaging Ltd
Wheatley Packaging Ltd
Hygena Ltd
Corus (UK) Ltd

## 3.3 Part B Industrial Processes

Whilst a number of new Part B processes have been authorised since the Updating & Screening Assessment in May 2003, only one process George Kmita Ltd requires further screening in accordance with Appendix 2 of Technical Guidance LAQM.TG(03).

**Screening Assessment George Kmita Ltd**

The process is a furnace for the extraction of non- ferrous metal from scrap operated in accordance with Process Guidance Note PG2/1. Reference to Appendix 2 of Technical Guidance LAQM.TG(03) identifies Lead as a pollutant of concern.

The mass emission of lead from the process has not been stated in the permit application and has therefore been extrapolated from the maximum allowable emission limit of 2mg/$m^3$. Assuming this worst case scenario of 0.002g/$m^3$ in conjunction with a furnace exhaust flow rate of 900$m^3$/hour (from isokinetic sampling test data) the emission rate of Lead can be assumed to be:-

900x 0.002 = 1.8g/hr

Annual Flow Rate is therefore

180 days x 24 hours (batch process)
4320 hr/yr
4320 x 900 = 3888000$m^3$/yr (Annual Total Exhaust Flow)

Annual Mass emission = 1.8g/hr x4320=7776g/year

3888000 x 0.002 = 7776g/yr
= 7.8kg/year

Mass emission of lead is therefore 7.8 kg/year at a stack height of 9.3 metres.

Reference to the nomogram in Figure 5.2 shows that receptors within 40m of the source require further consideration. The nearest relevant receptors are 200m from the site and therefore no further assessment of this source is required.

A list of new Part B processes is detailed in Appendix 7.

## 3.4 Other Industrial Sources

### 3.4.1 New Landfill, Quarrying and Mineral Processes

A number of planning permissions have been granted since publication of the Updating and Screening Assessment, however further clarification confirms that all but one of the permissions relates to renewals of existing permissions for existing sites. Theses site were considered in previous reports.

**Table 18 Permissions granted for Landfills, Quarries & Mineral Processes**

| Planning Application Number | Site Name | Site Operator | Application Description |
|---|---|---|---|
| PA/2002/1134 | Roxby Landfill | Bifffa | Landfill domestic, commercial & Industrial Waste |
| PA/2003/1092 | Crosby Warren | Sita UK td | Development of non hazardous landfill cell |
| PA/2003/1842 | Winterton Landfill | Waste Recycling Group | Reconfiguration of void |
| PA/2003/1422 | Yarbourough Quarry | Corus (UK) Ltd | Continued mineral extraction & waste disposal |
| PA/2004/0968 | Yarbourough Quarry | Corus (UK) Ltd | Vary Conditions |
| PA/2003/0601 | Cove Farm Haxey | WBB Minerals | Extension of sand quarry |

Only PA/2003/0601 at Cove Farm, Haxey will be considered in this report to determine its impact on air quality. Reference to estimated background concentrations of $PM_{10}$ for 2004 indicates that concentrations will be less than 26ug/$m^3$ in the vicinity of the site and therefore relevant exposure need only be considered within 200m of the quarry site. The closest residential dwelling to the site is 400m away and therefore there is no need to proceed further with regard to this site.

### 3.4.2 New Fuel Storage Depots

No new major fuel storage depots have been identified within North Lincolnshire.

### 3.4.3 Small Boilers

North Lincolnshire Council are not aware of any significant changes to >5$MW_{(thermal)}$ fuel plants and processes since the Updating and Screening Assessment.

### 3.4.4 Industrial Process Closures

There have been a number of Part B process closures since submission of the Updating & Screening Assessment in May 2003, see Appendix 8.

# 4.0 New Transport Developments

## 4.1 New Road Developments

There have been a small number of planning applications for development of new access roads into the sites of proposed residential developments. At present the roads are not located close to any relevant receptors and are unlikely to meet the required traffic flows detailed in Technical Guidance LAQM.TG(03). Should circumstances change these roads will be identified in the annual Nitrogen Dioxide review.

## 4.2 Significant Changes to Existing Roads

A number of roads have been identified that now exceed the annual average daily traffic flow (AADTF) of 10,000 vehicles per day. A list of the newly identified roads is contained in Table 10 in the Nitrogen Dioxide diffusion tube information.

## 4.3 Newly Identified Public Exposure to Vehicle Emissions

There has been no newly identified exposure to vehicle emissions in North Lincolnshire.

## 4.4 Other Transport Sources

As well as road vehicles, public exposure to emissions from planes, buses, trains, ships etc must be considered.

### 4.4.1 Trains

There are no new or newly identified locations where diesel locomotives are regularly stationary with relevant public exposure.

### 4.4.2 Airports

There are no new airports in North Lincolnshire, however the new Robin Hood Airport will open in Doncaster MBC area in April 2005 and will require future consideration.

### 4.4.3 Bus Stations

There are no newly identified bus stations in North Lincolnshire.

### 4.4.4 Shipping

There has been no significant increase in shipping related activity.

# 5.0 New Developments- Residential, Commercial and Public

The Council has a protocol in place to screen all planning applications submitted to the council for all environmental issues including air quality. Air quality assessments are requested as necessary and considered in light of the surrounding environment.

There have been no significant permissions granted within North Lincolnshire that have the potential to affect air quality.

## 5.1 New Housing Developments

A number of new housing developments have been proposed for North Lincolnshire, both previously designated in the local plan and speculative windfall sites. To date the planning applications have yet to be determined. With regard to the Lakeside development a monitoring exercise was conducted between July 2004 and January 2005. The report submitted in support of the planning application is contained at Appendix 9.

During the monitoring period, there were 6 recorded exceedances of the 24 hour mean $PM_{10}$ air quality objective at Lakeside 1, and 1 exceedence at Lakeside 2. The report concluded that it was unlikely, therefore, that in a full year, either of the locations monitored would exceed the annual mean $PM_{10}$ objective for 2004. Compared with the provisional $PM_{10}$ 2010 objectives, however, Lakeside 1 is likely to exceed both the annual mean and the 24 hour mean concentrations. Consequently, Lakeside 1 Partisol has been purchased by North Lincolnshire Council and continued monitoring is being carried out.

## 5.2 New Commercial Developments

The Gallagher Retail Park was developed on the A18 in Scunthorpe in 2002. Subsequent changes in road layout and crossing points in conjunction with the development have resulted in a substantial increase in traffic flow and queuing traffic. Consequently a $NO_2$ diffusion tube was located at the junction of Doncaster Road and Hilton Avenue close to the nearest relevant receptors. As previously stated in the chapter regarding Nitrogen Dioxide this location will possibly breach the air quality objective for Nitrogen Dioxide and it is proposed to install a ambient air quality monitor at this location.

## 5.3 New Public Developments

There have been no significant permissions granted for new public developments within North Lincolnshire that have the potential to affect air quality.

# 6.0 New Monitoring Sites for 2005

In order to determine the extent of air quality exceedences and investigate potential breaches identified since the Updating and Screening Assessment a number of new air quality monitoring locations have been installed or are in the process of being installed. Data from these sites will be reported for the year 2005 onwards. New locations are as follows: -

**Table 19 New Ambient Air Quality Monitoring Stations**

| Location | Town | Grid Ref | Poll | Technique | Site Start Date |
|---|---|---|---|---|---|
| Rowland Road | Scunthorpe | SE9031010830 | $PM_{10}$ | Partisol | 1/12/04 |
| Lakeside | Scunthorpe | SE9175508242 | $PM_{10}$ | Partisol | 24/7/04 |
| Lincoln Gardens | Scunthorpe | SE8949008910 | $PM_{10}$ | TEOM | 1/12/04 |
| East Common Lane | Scunthorpe | SE9066209791 | $PM_{10}$ | TEOM | 3/3/05 |
| Ermine Farm | Appleby | SE9481514964 | $PM_{10}$ | TEOM | 24/3/05 |
| | | | $SO_2$ | Chemilumine sence | |
| | | | NOx | Chemilumine sence | |
| Allanby Street | Scunthorpe | SE8927311446 | $PM_{10}$ | TEOM | 28/4/05 |
| Dawes Lane, Santon | Scunthorpe | SE9294711937 | $PM_{10}$ | TEOM | |
| Appleby Gardens | Broughton | SE9604809411 | $PM_{10}$ | TEOM | |
| Ashby Road/Lloyds Ave | Scunthorpe | SE8914609888 | NOx | Chemilumine sence | |
| Gallagher Retail Park | Scunthorpe | SE8671011111 | NOx | Chemilumine sence | |

Using updated traffic data, information regarding new residential developments and local knowledge, projected to 2005, the locations of the diffusion tubes were reviewed again at the end of 2004. From this review, tubes have been located in the following positions:

**Table 20 New NOx Monitoring Locations for 2005**

| Location | National Grid Reference |
|---|---|
| Mortal Ash / Brigg Road Roundabout | SE9185708639 |
| Lakeside Parkway | SE9172408388 |
| Old Brumby/East Common Lane/Queensway | SE8977109698 |
| Dudley Road/Queensway | SE9150308664 |
| Lloyds Avenue/Ashby Road | SE8913509885 |
| Ashby Road / Queensway Roundabout | SE8917809940 |
| A1077 Orbital Road | SE8654211957 |
| Lloyds Avenue/Glover Road | SE8848609946 |
| Normanby Road | SE8941611944 |
| Scotter Road | SE8721911096 |
| Keadby Bridge | SE8396310652 |
| Belton Road junction, Epworth, | SE7806403922 |

# 7.0 Conclusions & Recommendations

Having considered the air quality monitoring data for 2004 the following actions will be implemented.

## Benzene

The benzene diffusion tube survey will continue for a further 12 month period commencing March 2005 at two sites in Scunthorpe with the potential to breach the 2010 annual mean objective of 5$\mu g/m^3$. The tubes will be located at Dawes Lane, High Santon and High Street East, Scunthorpe.

## Nitrogen Dioxide

The nitrogen dioxide diffusion tube survey will continue to be reviewed in accordance with Technical Guidance LAQM.TG(03).

In the two locations identified as likely to breach the 2005 annual mean air quality objective of 40$\mu g/m^3$ for nitrogen dioxide a chemiluminescence analyser will be installed.

The proposed installation sites are

- Kingsway House, Lloyds Avenue / Ashby Road, Scunthorpe
- Gallagher Retail Park, Doncaster Road, Scunthorpe

Data from these will also be used to assess these locations against the 2005 1 hour mean objective of 200$\mu g/m^3$ not to be exceeded more than 18 times a year.

## Sulphur Dioxide

No further work is required in relation to sulphur dioxide, although the existing monitoring locations at Rowland Road, Scunthorpe and Killingholme Primary School will remain. The mobile Groundhog unit will be relocated to Dawes Lane, High Santon to monitor emissions from the industrial processes to the east of Scunthorpe.

## Particulate Matter $PM_{10}$

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

**Other Pollutants**

As discussed in sections 3,4 and 5, there have been no new developments considered to have a significant impact on air quality within North Lincolnshire. We are therefore satisfied that, unless the situation changes significantly, all other air quality objectives will continue to be met.

# References and Sources of Information

Local Air Quality Management Technical Guidance, LAQM.TG(03), issued by the DEFRA.

Local Air Quality Management Policy Guidance, LAQM.PG(03), issued by the DEFRA.

Local Air Quality Management Progress Report Guidance, LAQM.PRG(03), issued by the DEFRA.

The Environment Agency Internet website, www.environment-agency.gov.uk, including the Pollution Inventory

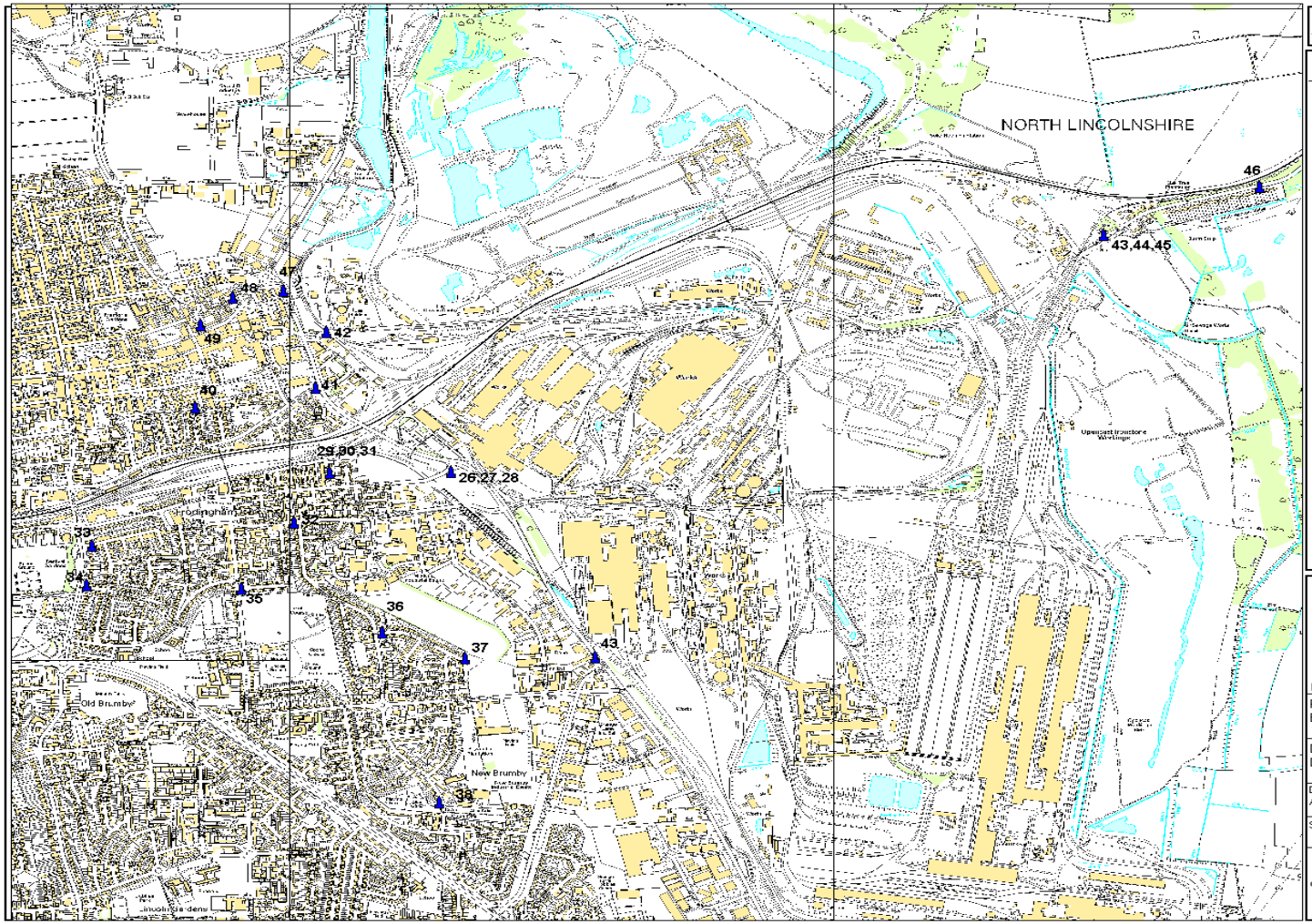
NETCEN Air Quality Archive, www.airquality.co.uk/archive/index.php

Air Quality Review & Assessment Round 2

- Updating & Screening Assessment May 2003 - North Lincolnshire Council.
- Detailed Assessment April 2004 - North Lincolnshire Council

# Appendices

## Appendix 1 Map of Benzene Diffusion Tube Locations Scunthorpe




A3 Printer Frame
Map Area 318mm / 281mm

Notes

Directorate of Environment and Public Protection

Environmental Protection Unit

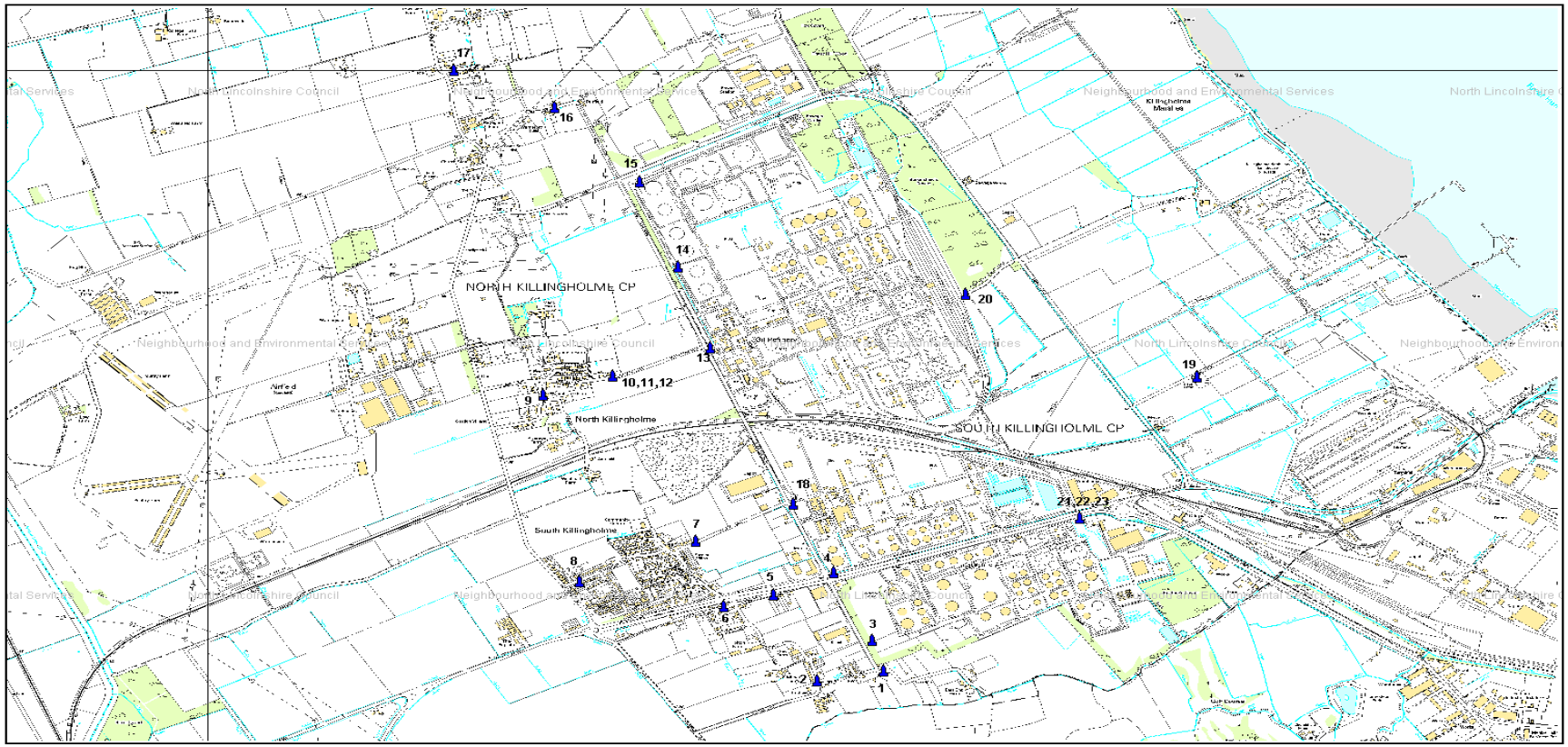
Director, E. Lodge, BA, DMA, MCIEH, MinstWM, MIHE

Project Title
Benzene Survey - Killingholme

Drawing Title
Diffusion tubes location

| Drawn by; | Date; |
|---|---|
| AS | 19/09/03 |
| SCALE; | App'd by; |

## Appendix 2 Map of Benzene Diffusion Tube Locations Killingholme

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Drawing Title: Benzene Survey - Killingholme, Diffusion Tube Loactions

Drawn by: AS

Scale: NOT TO SCALE | Date: 19/09/2003

Neighbourhood and Environmental Services

Head of Service, Keith Ford

## Appendix 3 - Benzene Monitoring Strategy / Analysis

Fifty diffusion tubes were received from the laboratory at the end of each month and put in their monitoring locations on a predetermined date. The diffusion tubes had their own unique identification number used for reference by the laboratory. A written procedure was implemented for assigning and recording the reference identification and corresponding location number for each tube at every location prior to mounting on site.

On the day of tube change over the exposed tubes were collected and the replacement tube put out for exposure. The start and finish time of each tube exposure period was recorded. The collected tubes were sent to the laboratory for analysis accompanied by the chain of custody sheet detailing the exposure time for each tube reference number.

A report was sent by the laboratory 10-14 days after receipt of the diffusion tubes stating the total benzene measured during the desorption process, expressed in nanogrammes (ng) and the corresponding concentration of benzene for each tube in parts per billion (ppb). The concentrations for each tube reference number were then cross referenced to the tube location numbers. This gave a value for monthly benzene concentration at a given location.

The criteria used to select the laboratory to supply and analyse the diffusion tubes, included UKAS accreditation and membership of the WASP (Workplace Analysis Scheme for Proficiency) scheme. The laboratory selected for supply and analysis was Harwell Scientifics.

The analysis method of the chromosorb tubes for benzene was thermal desorption - gas chromatography - mass spectrometry. The results obtained from the analysis were used in conjunction with the sampling times (time exposed to ambient air) to produce the concentration data in ppb for each sampling location.

The analysis data provided by the laboratory expressed the results as the total amount of benzene on each tube in ng, and the concentration of benzene for each sample in ppb. This was calculated using the known exposure times and the uptake rate obtained from the Health and Safety Executive/CAR/Working group 5 compilation for Perkin Elmer tubes (reference: The Diffusive Monitor, July 2001, Issue 12). The limit of detection for analysis of benzene was 0.07ppb.

The benzene concentrations at each location are expressed in $\mu g/m^3$, this is the concentration in ppb multiplied by a factor of 3.25. The 3.25 factor was taken from the Technical Guidance note LAQM.TG(03).

Where tubes were co-located at a monitoring site, the maximum value of all three tubes was used for each month to determine the annual mean. The maximum monthly value was used to represent the worst-case scenario.

For certain months data is unavailable for some locations, due to either the loss of the diffusion tube whilst monitoring, or on some occasions contamination of the tube resulting in unsuccessful analysis. In addition some analysis results were received detailing benzene concentration of 0.20$\mu g/m^3$, i.e. equivalent to the unexposed control tube, these results were therefore omitted from calculation of the annual mean due to the possibility that the levels were inaccurate due to monitoring errors.

## Appendix 4 Benzene Diffusion Tube Raw Results ppb

| Tube ID | NGR | Dec | Jan | Feb | Mar | April | May | June | July | Aug | Sept | Oct | Nov | Ave |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **1** | TA 15941568 | 0.49 | 0.51 | 0.77 | 0.64 | 0.71 | 0.60 | 0.17 | 0.27 | 0.23 | 0.14 | 0.37 | 0.37 | 0.44 |
| **2** | TA 15661563 | 0.43 | 0.44 | 0.58 | 0.49 | 0.46 | 0.50 | | 0.13 | 0.32 | 0.68 | 0.22 | 0.34 | 0.42 |
| **3** | TA 15901585 | | 0.67 | 1.70 | 0.99 | 1.10 | 1.22 | | | 0.58 | 0.13 | 0.48 | 0.50 | 0.82 |
| **4** | TA 15731621 | 1.80 | 0.68 | 2.30 | 1.4 | 1.20 | 1.39 | 0.42 | 2.01 | 0.85 | 0.22 | 0.37 | 0.53 | 1.10 |
| **5** | TA 15471610 | 0.80 | 0.45 | 0.93 | 0.62 | 0.42 | 0.45 | 0.16 | 0.35 | 0.44 | 0.12 | 0.36 | 0.30 | 0.45 |
| **6** | TA 15231602 | 0.54 | 0.46 | 0.82 | 0.52 | | 0.30 | 0.12 | 0.21 | 0.32 | 0.13 | 0.27 | 0.31 | 0.36 |
| **7** | TA 15131640 | 0.34 | | 0.75 | 0.49 | 0.43 | 0.30 | 0.17 | 0.18 | 0.47 | 0.28 | 0.25 | 0.29 | 0.36 |
| **8** | TA 14621616 | | 0.41 | 0.73 | 0.55 | 0.34 | 0.30 | 0.16 | 0.16 | | 0.18 | 0.21 | 0.37 | 0.34 |
| **9** | TA 14461721 | 0.10 | 0.41 | 0.44 | 0.36 | 0.30 | 0.21 | 0.14 | 0.19 | 0.36 | 0.13 | 0.07 | 0.28 | 0.25 |
| **10** | TA 14761730 | 0.61 | 0.48 | 0.55 | 0.43 | 0.33 | 0.33 | 0.17 | 0.07 | 0.33 | 0.56 | 0.30 | 0.35 | 0.38 |
| **11** | Co-loc | 0.49 | 0.35 | 0.50 | 0.41 | 0.37 | 0.30 | | 0.31 | 0.43 | 0.06 | 0.35 | 0.28 | 0.35 |
| **12** | Co-loc | 0.49 | 0.46 | 0.55 | 0.26 | 0.35 | 0.29 | 0.23 | 0.25 | 0.45 | 0.06 | 0.27 | 0.27 | 0.33 |
| **13** | TA 15181747 | 0.69 | 0.47 | 1.10 | 0.71 | 0.58 | 0.50 | | 0.37 | 0.61 | 0.06 | 0.62 | 0.46 | 0.56 |
| **14** | TA 15041790 | 0.72 | 0.50 | 1.50 | 1.1 | | 0.75 | 0.54 | 0.70 | 1.56 | 0.44 | 0.90 | 0.38 | 0.83 |

| Tube ID | NGR | Dec | Jan | Feb | Mar | April | May | June | July | Aug | Sept | Oct | Nov | Ave |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **15** | TA 14881835 | 0.40 | 0.35 | 0.45 | 0.5 | 0.38 | 0.44 | 0.37 | 0.48 | 0.78 | 0.36 | 0.55 | 0.25 | 0.44 |
| **16** | TA 14511879 | 1.80 | 0.45 | 0.32 | 0.34 | 0.33 | 0.28 | 0.34 | 0.43 | 0.35 | 0.18 | 0.29 | 0.28 | 0.45 |
| **17** | TA 14071899 | 0.29 | 0.42 | 0.37 | 0.61 | 0.28 | 0.25 | 0.21 | 0.32 | 0.54 | 0.10 | 0.29 | 0.26 | 0.33 |
| **18** | TA 15561659 | 0.78 | 0.76 | 1.30 | 1.1 | 1.20 | 0.93 | 0.59 | 1.06 | 3.14 | 1.00 | 1.65 | 1.06 | 1.21 |
| **19** | TA 17321731 | 0.55 | 0.77 | 1.10 | 0.76 | 0.68 | 0.55 | 0.48 | 0.36 | 0.66 | 0.07 | 0.60 | 0.56 | 0.60 |
| **20** | TA 16301776 | 1.30 | 1.70 | 1.30 | 0.94 | 0.85 | 0.70 | 0.79 |  |  | 0.38 | 0.47 | 0.87 | 0.93 |
| **21** | TA 16811652 | 0.32 | 2.70 | 0.71 | 2.3 | 1.00 | 1.51 | 1.95 | 3.04 | 1.80 | 0.13 | 0.80 | 0.53 | 1.40 |
| **22** | Co-location | 1.60 |  | 3.60 | 2.2 | 1.00 | 1.57 | 1.64 | 2.03 | 2.09 | 0.26 | 0.87 | 2.17 | 1.73 |
| **23** | Co-location | 1.80 | 2.70 | 4.40 | 2.1 | 1.00 | 1.53 | 1.11 | 0.41 |  | 0.19 | 0.80 | 1.49 | 1.59 |
| **24** | TA 10121334 | 0.52 | 0.42 | 0.41 |  | 0.25 | 0.43 | 0.19 |  |  |  | 0.15 | 0.24 | 0.33 |
| **25** | TA02370842 | 0.43 | 0.58 | 0.46 | 0.41 | 0.28 | 0.26 | 0.19 | 0.27 | 0.17 | 0.24 | 0.14 | 0.34 | 0.31 |
| **26** | SE 90591088 | 1.00 | 0.58 | 0.92 | 0.59 | 0.36 | 0.32 | 0.37 | 0.39 | 0.85 | 0.23 | 0.82 | 0.51 | 0.58 |
| **27** | SE 90591088 | 0.99 | 0.60 | 0.89 | 0.55 | 0.46 | 0.49 | 0.36 | 0.43 | 0.77 | 0.06 | 1.02 | 0.36 | 0.58 |
| **28** | SE 90591088 | 0.90 | 0.61 | 0.87 | 0.64 | 0.43 | 0.48 | 0.34 | 0.39 | 0.83 | 0.50 | 1.04 | 0.44 | 0.62 |
| **29** | SE 90141086 | 0.94 | 0.54 | 0.66 | 0.51 |  | 0.34 | 0.25 | 0.14 | 0.50 | 0.19 | 0.53 | 0.39 | 0.45 |
| **30** | SE 90141086 | 0.68 | 0.53 | 1.30 | 0.47 | 0.31 | 0.39 | 0.24 | 0.26 | 0.48 | 0.06 | 0.69 | 0.28 | 0.47 |

| Tube ID | NGR | Dec | Jan | Feb | Mar | April | May | June | July | Aug | Sept | Oct | Nov | Ave |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 31 | SE 90141086 | 0.81 | 0.52 | 0.69 | 0.5 | 0.44 | 0.34 | 0.24 | 0.20 | 0.48 | 0.45 | 0.61 | 0.38 | 0.47 |
| 32 | SE 90011063 | 0.94 | 0.70 | 1.00 | 0.58 | 0.63 | 0.25 | 0.31 | 0.46 | 0.51 | 0.79 | 0.50 | 0.44 | 0.59 |
| 33 | SE 89271053 | 1.10 | 0.66 | 0.90 | 0.67 | 0.66 | 0.53 | 0.34 | 0.45 | 0.43 | 0.29 | 0.50 | 0.45 | 0.58 |
| 34 | SE 89251035 | 1.00 | 0.66 | 0.69 | 0.67 | 0.43 | 0.42 | 0.27 | 0.38 | 0.34 | 0.30 | 0.29 | 0.33 | 0.48 |
| 35 | SE 89821033 | 0.53 | 0.60 | 0.68 | 0.47 |  | 0.39 | 0.07 | 0.07 | 0.36 | 0.24 | 0.26 | 0.25 | 0.36 |
| 36 | SE 90331013 | 0.78 |  | 0.90 | 0.53 | 0.29 | 0.35 | 0.25 | 0.34 | 0.34 | 0.35 | 0.30 | 0.27 | 0.43 |
| 37 | SE 90641001 | 0.91 | 0.47 | 0.71 | 0.55 | 0.31 | 0.35 | 0.22 | 0.36 |  |  | 0.33 | 0.42 | 0.46 |
| 38 | SE 90540935 | 0.60 | 0.51 |  |  |  | 0.36 | 0.19 | 0.17 | 0.33 | 0.06 | 0.17 | 0.33 | 0.30 |
| 39 | SE 91111003 | 1.60 | 0.67 | 1.10 | 0.91 | 0.90 | 0.80 | 0.30 | 0.48 | 0.36 | 0.37 | 0.41 | 0.63 | 0.71 |
| 40 | SE 89641116 | 0.53 | 0.47 | 0.58 | 0.47 | 0.39 | 0.32 | 0.19 | 0.30 | 0.58 | 0.16 | 0.53 | 0.30 | 0.40 |
| 41 | SE 90091126 | 1.40 | 0.68 | 0.87 | 0.27 | 0.61 | 0.50 | 0.40 | 0.32 | 0.66 | 0.16 | 0.63 | 0.57 | 0.59 |
| 42 | SE 90121152 | 1.30 | 0.68 | 1.50 | 0.81 | 1.10 | 0.86 | 0.31 | 0.57 | 0.49 | 0.50 | 0.82 | 0.68 | 0.80 |
| 43 | SE 92981195 | 1.10 | 1.60 | 1.30 | 0.95 | 0.50 | 0.47 | 0.82 | 0.96 | 0.35 | 1.15 | 0.70 | 1.10 | 0.92 |
| 44 | Co-location | 1.50 | 2.00 | 1.00 | 0.93 | 0.48 | 0.37 | 1.07 | 0.86 | 0.36 | 0.06 | 0.66 | 1.40 | 0.89 |
| 45 | Co-location | 1.50 | 1.80 | 1.20 | 1 | 0.47 | 0.46 | 1.09 | 0.60 | 0.44 | 0.96 | 0.61 | 1.27 | 0.95 |
| 46 | SE 93541218 | 0.66 | 1.10 | 0.85 | 0.69 | 0.36 | 0.37 | 0.60 | 0.36 | 0.30 | 1.38 | 0.41 |  | 0.64 |

| Tube ID | NGR | Dec | Jan | Feb | Mar | April | May | June | July | Aug | Sept | Oct | Nov | Ave |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 47 | SE 89971170 | 1.10 | 0.61 | 1.10 | 1 | 0.73 | 0.83 | | 0.78 | 1.02 | 0.45 | 1.10 | 0.57 | 0.84 |
| 48 | SE 89781167 | 0.91 | 0.34 | 0.55 | 0.72 | 0.45 | 0.41 | 0.33 | 0.35 | 0.57 | 0.06 | 0.58 | 0.38 | 0.47 |
| 49 | SE 89661155 | 0.94 | 0.47 | 0.58 | 0.57 | 0.32 | 0.29 | 0.30 | 0.41 | 0.52 | | 0.53 | 0.32 | 0.48 |
| 50 | | 0.08 | 0.06 | 0.07 | 0.07 | 0.06 | 0.07 | 0.07 | 0.06 | 0.07 | 0.06 | 0.07 | | 0.07 |

## Appendix 5 Benzene Diffusion Tube Raw Results ug/m$^3$

| Tube ID | NGR | Dec | Jan | Feb | Mar | April | May | June | July | Aug | Sept | Oct | Nov | Ave |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **1** | TA 15941568 | 1.59 | 1.66 | 2.50 | 2.08 | 2.31 | 1.95 | 0.55 | 0.88 | 0.75 | 0.46 | 1.20 | 1.20 | 1.43 |
| **2** | TA 15661563 | 1.40 | 1.43 | 1.89 | 1.59 | 1.50 | 1.63 | | 0.42 | 1.04 | 2.21 | 0.72 | 1.11 | 1.36 |
| **3** | TA 15901585 | | 2.18 | 5.53 | 3.22 | 3.58 | 3.97 | | | 1.89 | 0.42 | 1.56 | 1.63 | 2.66 |
| **4** | TA 15731621 | 5.85 | 2.21 | 7.48 | 4.55 | 3.90 | 4.52 | 1.37 | 6.53 | 2.76 | 0.72 | 1.20 | 1.72 | 3.57 |
| **5** | TA 15471610 | 2.60 | 1.46 | 3.02 | 2.02 | 1.37 | 1.46 | 0.52 | 1.14 | 1.43 | 0.39 | 1.17 | 0.98 | 1.46 |
| **6** | TA 15231602 | 1.76 | 1.50 | 2.67 | 1.69 | | 0.98 | 0.39 | 0.68 | 1.04 | 0.42 | 0.88 | 1.01 | 1.18 |
| **7** | TA 15131640 | 1.11 | | 2.44 | 1.59 | 1.40 | 0.98 | 0.55 | 0.59 | 1.53 | 0.91 | 0.81 | 0.94 | 1.17 |
| **8** | TA 14621616 | | 1.33 | 2.37 | 1.79 | 1.11 | 0.98 | 0.52 | 0.52 | | 0.59 | 0.68 | 1.20 | 1.11 |
| **9** | TA 14461721 | 0.33 | 1.33 | 1.43 | 1.17 | 0.98 | 0.68 | 0.46 | 0.62 | 1.17 | 0.42 | *0.23* | 0.91 | 0.81 |
| **10** | TA 14761730 | **1.98** | **1.56** | **1.79** | **1.40** | 1.07 | **1.07** | 0.55 | 0.23 | 1.07 | **1.82** | 0.98 | **1.14** | **1.22** |
| **11** | Co-location | 1.59 | 1.14 | 1.63 | 1.33 | **1.20** | 0.98 | | **1.01** | 1.40 | 0.20 | **1.14** | 0.91 | 1.14 |
| **12** | Co-location | 1.59 | 1.50 | 1.79 | 0.85 | 1.14 | 0.94 | **0.75** | 0.81 | **1.46** | 0.20 | 0.88 | 0.88 | 1.06 |
| **13** | TA 15181747 | 2.24 | 1.53 | 3.58 | 2.31 | 1.89 | 1.63 | | 1.20 | 1.98 | *0.20* | 2.02 | 1.50 | 1.82 |
| **14** | TA 15041790 | 2.34 | 1.63 | 4.88 | 3.58 | | 2.44 | 1.76 | 2.28 | 5.07 | 1.43 | 2.93 | 1.24 | 2.69 |
| **15** | TA 14881835 | 1.30 | 1.14 | 1.46 | 1.63 | 1.24 | 1.43 | 1.20 | 1.56 | 2.54 | 1.17 | 1.79 | 0.81 | 1.44 |

| Tube ID | NGR | Dec | Jan | Feb | Mar | April | May | June | July | Aug | Sept | Oct | Nov | Ave |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **16** | TA 14511879 | 5.85 | 1.46 | 1.04 | 1.11 | 1.07 | 0.91 | 1.11 | 1.40 | 1.14 | 0.59 | 0.94 | 0.91 | 1.46 |
| **17** | TA 14071899 | 0.94 | 1.37 | 1.20 | 1.98 | 0.91 | 0.81 | 0.68 | 1.04 | 1.76 | 0.33 | 0.94 | 0.85 | 1.07 |
| **18** | TA 15561659 | 2.54 | 2.47 | 4.23 | 3.58 | 3.90 | 3.02 | 1.92 | 3.45 | 10.21 | 3.25 | 5.36 | 3.45 | 3.95 |
| **19** | TA 17321731 | 1.79 | 2.50 | 3.58 | 2.47 | 2.21 | 1.79 | 1.56 | 1.17 | 2.15 | *0.23* | 1.95 | 1.82 | 1.93 |
| **20** | TA 16301776 | 4.23 | 5.53 | 4.23 | 3.06 | 2.76 | 2.28 | 2.57 | | | 1.24 | 1.53 | 2.83 | 3.02 |
| **21** | TA 16811652 | 1.04 | **8.78** | 2.31 | **7.48** | **3.25** | 4.91 | **6.34** | **9.88** | 5.85 | 0.42 | 2.60 | 1.72 | 4.55 |
| **22** | Co-location | 5.20 | | 11.70 | 7.15 | 3.25 | **5.10** | 5.33 | 6.60 | **6.79** | **0.85** | **2.83** | **7.05** | **5.62** |
| **23** | Co-location | **5.85** | 8.78 | **14.30** | 6.83 | 3.25 | 4.97 | 3.61 | 1.33 | | 0.62 | 2.60 | 4.84 | 5.18 |
| **24** | TA 10121334 | 1.69 | 1.37 | 1.33 | | 0.81 | 1.40 | 0.62 | | | | 0.49 | 0.78 | 1.06 |
| **25** | TA02370842 | 1.40 | 1.89 | 1.50 | 1.33 | 0.91 | 0.85 | 0.62 | 0.88 | 0.55 | 0.78 | 0.46 | 1.11 | 1.02 |
| **26** | SE 90591088 | 3.25 | 1.89 | 2.99 | 1.92 | 1.17 | 1.04 | 1.20 | 1.27 | 2.76 | 0.75 | 2.67 | 1.66 | 1.88 |
| **27** | SE 90591088 | 3.22 | 1.95 | 2.89 | 1.79 | 1.50 | 1.59 | 1.17 | 1.40 | 2.50 | 0.20 | 3.32 | 1.17 | 1.89 |
| **28** | SE 90591088 | 2.93 | 1.98 | 2.83 | 2.08 | 1.40 | 1.56 | 1.11 | 1.27 | 2.70 | 1.63 | 3.38 | 1.43 | 2.02 |
| **29** | SE 90141086 | **3.06** | **1.76** | 2.15 | **1.66** | | 1.11 | **0.81** | 0.46 | **1.63** | 0.62 | 1.72 | **1.27** | 1.47 |
| **30** | Co-location | 2.21 | 1.72 | **4.23** | 1.53 | 1.01 | **1.27** | 0.78 | **0.85** | 1.56 | 0.20 | **2.24** | 0.91 | **1.54** |
| **31** | Co-location | 2.63 | 1.69 | 2.24 | 1.63 | **1.43** | 1.11 | 0.78 | 0.65 | 1.56 | **1.46** | 1.98 | 1.24 | 1.53 |

| Tube ID | NGR | Dec | Jan | Feb | Mar | April | May | June | July | Aug | Sept | Oct | Nov | Ave |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **32** | SE 90011063 | 3.06 | 2.28 | 3.25 | 1.89 | 2.05 | 0.81 | 1.01 | 1.50 | 1.66 | 2.57 | 1.63 | 1.43 | 1.93 |
| **33** | SE 89271053 | 3.58 | 2.15 | 2.93 | 2.18 | 2.15 | 1.72 | 1.11 | 1.46 | 1.40 | 0.94 | 1.63 | 1.46 | 1.89 |
| **34** | SE 89251035 | 3.25 | 2.15 | 2.24 | 2.18 | 1.40 | 1.37 | 0.88 | 1.24 | 1.11 | 0.98 | 0.94 | 1.07 | 1.57 |
| **35** | SE 89821033 | 1.72 | 1.95 | 2.21 | 1.53 | | 1.27 | *0.23* | *0.23* | 1.17 | 0.78 | 0.85 | 0.81 | 1.16 |
| **36** | SE 90331013 | 2.54 | | 2.93 | 1.72 | 0.94 | 1.14 | 0.81 | 1.11 | 1.11 | 1.14 | 0.98 | 0.88 | 1.39 |
| **37** | SE 90641001 | 2.96 | 1.53 | 2.31 | 1.79 | 1.01 | 1.14 | 0.72 | 1.17 | | | 1.07 | 1.37 | 1.50 |
| **38** | SE 90540935 | 1.95 | 1.66 | | | | 1.17 | 0.62 | 0.55 | 1.07 | *0.20* | 0.55 | 1.07 | 0.98 |
| **39** | SE91111003 | 5.20 | 2.18 | 3.58 | 2.96 | 2.93 | 2.60 | 0.98 | 1.56 | 1.17 | 1.20 | 1.33 | 2.05 | 2.31 |
| **40** | SE89641116 | 1.72 | 1.53 | 1.89 | 1.53 | 1.27 | 1.04 | 0.62 | 0.98 | 1.89 | 0.52 | 1.72 | 0.98 | 1.31 |
| **41** | SE90091126 | 4.55 | 2.21 | 2.83 | 0.88 | 1.98 | 1.63 | 1.30 | 1.04 | 2.15 | 0.52 | 2.05 | 1.85 | 1.91 |
| **42** | SE 90121152 | 4.23 | 2.21 | 4.88 | 2.63 | 3.58 | 2.80 | 1.01 | 1.85 | 1.59 | 1.63 | 2.67 | 2.21 | 2.61 |
| **43** | SE 92981195 | 3.58 | 5.20 | **4.23** | 3.09 | **1.63** | **1.53** | 2.67 | **3.12** | 1.14 | **3.74** | **2.28** | 3.58 | 2.98 |
| **44** | Co-location | 4.88 | **6.50** | 3.25 | 3.02 | 1.56 | 1.20 | 3.48 | 2.80 | 1.17 | 0.20 | 2.15 | **4.55** | 2.90 |
| **45** | Co-location | **4.88** | 5.85 | 3.90 | **3.25** | 1.53 | 1.50 | **3.54** | 1.95 | **1.43** | 3.12 | 1.98 | 4.13 | **3.09** |
| **46** | SE 93541218 | 2.15 | 3.58 | 2.76 | 2.24 | 1.17 | 1.20 | 1.95 | 1.17 | 0.98 | 4.49 | 1.33 | | 2.09 |
| **47** | SE 89971170 | 3.58 | 1.98 | 3.58 | 3.25 | 2.37 | 2.70 | | 2.54 | 3.32 | 1.46 | 3.58 | 1.85 | 2.74 |

| Tube ID | NGR | Dec | Jan | Feb | Mar | April | May | June | July | Aug | Sept | Oct | Nov | Ave |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **48** | SE 89781167 | 2.96 | 1.11 | 1.79 | 2.34 | 1.46 | 1.33 | 1.07 | 1.14 | 1.85 | *0.20* | 1.89 | 1.24 | 1.53 |
| **49** | SE 89661155 | 3.06 | 1.53 | 1.89 | 1.85 | 1.04 | 0.94 | 0.98 | 1.33 | 1.69 | | 1.72 | 1.04 | 1.55 |
| **50** | Control Tube | 0.26 | 0.20 | 0.23 | 0.23 | 0.20 | 0.23 | 0.23 | 0.20 | 0.23 | 0.20 | 0.23 | | 0.22 |

**Key**

Collocated tubes are highlighted in grayscale
The maximum monthly value from the collocated tube used to calculate the annual mean is identified in bold type
Values greater that the Air Quality Objective of 5ug/$m^3$ are identified in red
Data excluded from the study is marked in italics

## Appendix 6 Nitrogen Dioxide Diffusion Tube Raw Data

| Location | Jan | Feb | Mar | April | May | June | July | Aug | Sept | Oct | Nov | Dec | 2004 | 2005 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Frodingham Road, Scunthorpe | 46 | 42 | 41 | 37 | 33 | 34 | 36 | 35 | 37 | 31 | 43 | 44 | 38 | 37 |
| **Britannia Corner, Scunthorpe** | **60** | **57** | **-** | **47** | **46** | **45** | **46** | **-** | **41** | **43** | **59** | **42** | **49** | **47** |
| **Doncaster Rd/ Hilton Ave, Scunthorpe** | **61** | **51** | **52** | **42** | **41** | **43** | **51** | **21** | **51** | **50** | **56** | **54** | **48** | **47** |
| Doncaster Rd/ Henderson Ave, Scunthorpe | 35 | 41 | 39 | 37 | 33 | 27 | 35 | 15 | 33 | 37 | 39 | 42 | 34 | 34 |
| **Oswald Road, Scunthorpe** | **47** | **49** | **47** | **42** | **38** | **33** | **42** | **40** | **39** | **33** | **46** | **48** | **42** | **41** |
| **Ashby Road, Scunthorpe** | **45** | **53** | **42** | **39** | **35** | **33** | **34** | **57** | **-** | **31** | **47** | **36** | **41** | **40** |
| **Ashby Road/ Old Brumby St, Scunthorpe** | **50** | **48** | **49** | **45** | **43** | **37** | **43** | **37** | **42** | **41** | **51** | **48** | **45** | **43** |
| Ashby Rd/ Ashby High St, Scunthorpe | 51 | - | 38 | 35 | 29 | - | 34 | 35 | - | - | - | 46 | 38 | 37 |
| **Ashby High St/ Bottesford Rd, Scunthorpe** | **54** | **33** | **49** | **-** | **37** | **33** | **40** | **32** | **-** | **44** | **53** | **56** | **43** | **42** |
| Butterwick Road, Messingham | 33 | 25 | 26 | 20 | 20 | 17 | 27 | 18 | - | 27 | 33 | 32 | 25 | 25 |
| High St, Messingham | 37 | 25 | - | - | 30 | - | 16 | 28 | - | 34 | 38 | 39 | 31 | 30 |

| Location | Jan | Feb | Mar | April | May | June | July | Aug | Sept | Oct | Nov | Dec | 2004 | 2005 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Bridge St, Brigg | - | - | 8 | 27 | 32 | 28 | 34 | - | 33 | 32 | 40 | 40 | 30 | 30 |
| Barnard Ave, Brigg | 53 | 33 | 48 | 32 | 32 | 37 | 16 | 42 | 38 | 38 | 50 | 52 | 39 | 38 |
| Station Rd, Brigg / Hewson House Background | 34 | 28 | 22 | 16 | 15 | 16 | 16 | 14 | 19 | 18 | 23 | 25 | 21 | 20 |
| Station Rd, Brigg / Hewson House Roadside | 25 | 22 | 31 | 24 | 22 | 21 | 23 | 21 | 23 | 26 | 33 | 34 | 25 | 25 |
| Wrawby Rd,Brigg | 43 | 31 | 39 | 31 | 30 | 31 | 40 | 34 | 33 | 35 | 40 | 45 | 36 | 35 |
| Humber Rd, South Killinghome | 34 | 36 | 43 | 39 | 38 | 32 | 36 | 31 | 38 | 32 | 38 | 38 | 36 | 35 |
| St Crispins Close, South Killingholme | 31 | 23 | 24 | 23 | 17 | 20 | 21 | 22 | 23 | 25 | 28 | 35 | 24 | 24 |
| Killingholme Primary School | 31 | 28 | 30 | 27 | - | - | - | - | - | 26 | 29 | 35 | 29 | 29 |
| Killingholme Primary School | 33 | 25 | 31 | 29 | - | - | - | - | - | 26 | 27 | 34 | 29 | 29 |
| Killingholme Primary School | 37 | 26 | 39 | 27 | - | - | - | - | - | 29 | 30 | 35 | 32 | 31 |
| Barrow Rd, Barton | 33 | 28 | 30 | 24 | - | 24 | 30 | - | 30 | - | - | - | 28 | 28 |
| **Holydyke, Barton** | **48** | **36** | **55** | **35** | **35** | **34** | **44** | **-** | **35** | **41** | **42** | **46** | **41** | **40** |
| Station Rd,/ Brigg Rd, Scunthorpe | 43 | 32 | 40 | 33 | 33 | 30 | 34 | - | 37 | 41 | 41 | 46 | 37 | 36 |

## Appendix 7 New Part B Processes in North Lincolnshire

| | Process | Process Guidance No. | Benzene | 1,3 Butadiene | Lead | Carbon Monoxide | Sulphur Dioxide | Nitrogen Dioxide | $PM_{10}$ |
|---|---|---|---|---|---|---|---|---|---|
| **George Kmita** | Furnaces for extraction of non-ferrous metal from scrap | PG2/1 | | | X | | | | |
| **ENOB Treatments Ltd** | Coating of Metal | PG6/23 | | | | | | | |
| **New Holland Extraction** | Animal & Plant Treatment | PG6/25 | | | | | | | |
| **AE Wilson** | Vehicle Respraying | PG6/34 | | | | | | | |
| **Lou's Tyres** | Waste Oil Burner | PG1/1 | | | | | | | |
| **Lafarge** | Blending, loading, packaging & use of bulk cement | PG3/1 | | | | | | | |
| **Go Car** | Vehicle Respraying | PG6/34 | | | | | | | |
| **Scunthorpe Sheet Metal** | Vehicle Respraying | PG6/34 | | | | | | | |
| **Chenez Ltd** | Manufacture of Timber | PG6/2 | | | | | | | |
| **AMS Bobcat** | Waste Oil Burner | PG1/1 | | | | | | | |
| **Quinton & Kains** | Manufacture & Coating of Timber | | | | | | | | |
| **HW Plastics** | Adhesive Coating | PG6/32 | | | | | | | |
| **Truck Lincs** | Waste Oil Burner | | | | | | | | |
| **Morris Youngs** | Vehicle Respraying | PG6/34 | | | | | | | |

## Appendix 8 Closed Part B Processes in North Lincolnshire

| | Process | Process Guidance No. | Benzene | 1,3 Butadiene | Lead | Carbon Monoxide | Sulphur Dioxide | Nitrogen Dioxide | $PM_{10}$ |
|---|---|---|---|---|---|---|---|---|---|
| **ENOB Treatments Ltd** | Coating of Metal | PG6/23 | | | | | | | |
| **Trentside Classic Cars** | Waste Oil Burner | PG1/1 | | | | | | | |
| **Lafarge** | Blending of Bulk Cement | PG3/1 | | | | | | | |
| **JHP Storage** | Mineral Storage | PG3/5 | | | | | | | X |
| **JHP Storage** | Mineral Storage | PG3/5 | | | | | | | X |
| **North Killingholme Storage** | Mineral Storage | PG3/5 | | | | | | | X |
| **Eurobait** | Maggot Breeding | PG6/5 | | | | | | | |
| **Stephen Gregory** | Waste Oil Burner | PG1/1 | | | | | | | |
| **John Beacock** | Waste Oil Burner | PG1/1 | | | | | | | |
| **Jotun Powder Coatings** | Coating Manufacture | PG6/9 | | | | | | | X |
| **Wrawby Services** | Waste Oil Burner | PG1/1 | | | | | | | |
| **Boilier Oil Seeds** | Animal & Plant Treatment | PG6/25 | | | | | | | |
| **SAVE** | Service Station | PG1/14 | | | | | | | |
| **Abbey Road Garage** | Waste Oil Burner | PG1/1 | | | | | | | |
| **Falcon Cycles** | Coating | PG6/23 & 6/31 | | | | | | | |
| **Heckett Multiserve (transferred to A1)** | Mineral Processing | PG3/8 | | | | | | | |

## Appendix 9 Air Quality Report for Development of Lakeside

## Appendix 10 – Relevant Locations for Air Quality Objectives

| Averaging Period | Objectives should apply at: | Objectives should generally not apply at: |
|---|---|---|
| **Annual Mean** | All locations where members of the public might be regularly exposed.<br><br>Building facades of residential properties, schools, hospitals, libraries, etc | Building facades of offices or other places of work where members of the public do not have regular access.<br><br>Gardens of residential properties.<br><br>Kerbside sites (as opposed to locations at the building façade), or any other location where public exposure is expected to be short term. |
| **24 Hour Mean and 8 Hour Mean** | All locations where the annual mean objective would apply.<br><br>Gardens of residential properties* | Kerbside sites (as opposed to locations at the building façade), or any other locations where public exposure is expected to be short term. |
| **1 Hour Mean** | All locations where the annual mean and 24 and 8 hour mean objectives apply.<br><br>Kerbside sites (eg pavements of busy shopping streets).<br><br>Those parts of car parks, bus stations and railway stations, etc which are not fully enclosed, where the public might reasonably be expected to spend 1 hour or more.<br><br>Any outdoor locations to which the public might reasonably be expected to spend 1 hour or longer. | Kerbside sites where the public would not be expected to have regular access. |
| **15 Minute Mean** | All locations where members of the public might reasonably be exposed for a period of 15 minutes or longer. | |

* Such locations should represent parts of the gardens where relevant public exposure is likely, for example where there are seating or play areas. It is unlikely that relevant public exposure would occur at the extremities of the garden boundary, or in front gardens, although local judgement should always be applied.

## Appendix 11 Glossary of Terms and Abbreviations

| | |
|---|---|
| **AQMA** | Air Quality Management Area, an area which a local authority has designated for action based upon predicted exceedences of Air Quality Objectives. An action plan must be drawn up to improve air quality. |
| **Air Quality Objective** | Policy targets generally expressed as a maximum ambient concentration to be achieved, either without exception or with a permitted number of exceedences within a specified timescale. |
| **Air Quality Standard** | The concentrations of pollutants in the atmosphere which can broadly be taken to achieive a certain level of environmental quality. The standards are based on assessment of the effects of each pollutant on human health including sensitive sub groups. |
| **Annual Mean** | The average of the concentrations measured for each pollutant for one year. In the case of Air Quality Objectives this is for a calender year. |
| **AURN** | Automated Urban & Rural Network of air pollution measurement sites, managed by contractors on behalf of Defra and Devolved Administrations. |
| **Average Time** | The period of time over, which a pollutant level, must be measured and the average result calculated. This can be a different period for each pollutant and directly affects which locations can be considered relevant. |
| **Concentration** | The amount of a (polluting) substance in a volume (of air), typically expressed as a mass of pollutant per unit volume of air (for example, microgrammes per cubic metre , $\mu g/m^3$) or a volume of gaseous pollutant per unit volume of air (parts per million, ppm). |
| **$C_6H_6$** | Benzene. |
| **CO** | Carbon monoxide |
| **Exceedence** | A period of time where the concentration of a pollutant is greater than the appropriate Air Quality Standard. |
| **DEFRA** | Department of Environment Food & Rural Affairs. The Government department responsible for U.K. air quality. |
| **Pollution Inventory** | A catalogue of the sources of a pollutant in an area, with |

| | |
|---|---|
| | information about their positions and the quantities emitted. Used in dispersion models. |
| **EPAQS** | The Expert Panel on Air Quality Standards. The U.K. group appointed by the government to set standards for maximum acceptable levels of pollutants. |
| **Fugitive Emissions** | Emissions of pollutants from a vent point other than a stack. |
| **IPC** | Integrated Pollution Control |
| **IPPC** | Integrated Pollution Prevention & Control |
| **$\mu g/m^3$** | Micrograms per cubic metre of air. A unit for describing the concentration of air pollutants in the atmosphere, as a mass of pollutant per unit volume of clean air. The unit is one thousand times larger than the $mg/m^3$ unit listed below. |
| **$mg/m^3$** | Milligrams per cubic metre of air. A measure of concentration in terms of mass per unit volume. A concentration of 1 $mg/m^3$ means that one cubic metre of air contains one microgramme (one millionth of a gram) of pollutant. |
| **NAQS** | National Air Quality Strategy. |
| **NO** | Nitrogen oxide. |
| **$NO_2$** | Nitrogen dioxide. |
| **$NO_X$** | Oxides of nitrogen. |
| **PAH's** | Polycyclic Aromatic Hydrocarbons |
| **Part A1 Processes** | An industrial process that is required to obtain a permit from the Environment Agency uner the Intergrated Pollution Prevention Control (IPPC) regime. Regulation of the emissions to air land, water & noise is included in the permit. |
| **Part A2 Processes** | An industrial process that is required to obtain a permit from the Local Authority under the Local authority Intergrated Pollution Prevention and Control (LA-IPPC) regime. Regulation of the emissions to air land, water & |

| | |
|---|---|
| | noise is included in the permit. |
| **Part B Processes** | An industrial process that is required to obtain a permit from the local authority under the Local Authority Polution Prevention Control (LAPPC) regime. Regulation of the emissions to air only is included in the permit. |
| **Particulates** | Suspended particulate matter is an non-gaseous material (liquid or solid) that, owing to its small gravitational settling rate, remains suspended in the atmosphere for appreciable time periods. |
| **Pb** | Lead. |
| **Percentile** | A value that is the rank at a particular point in a collection of data. For instance, a 98th percentile of values for a year is the value that 98% of all the data in the year fall below, or equal.<br><br>For example for nitrogen dioxide the hourly mean of 200$\mu g/m^3$ can be exceeded up to 18 times a year. This is the equivalent of the $99.8^{th}$ percentile being less than 200$\mu g/m^3$ because in one year there are 8760 hours of which 18 hours are 0.2% so 99.8% must be lower than the objective. |
| **$PM_{10}$** | Particulate matter less than 10 microns (millionths of a metre) in diameter. |
| **ppb** | Parts per billion. |
| **ppm** | Parts per million. |
| **QA/QC** | Quality Assurance / Quality Control |
| **Relevant Locations** | These can differ for each pollutant according to the averaging period considered. Relevant locations are those areas where the public might reasonably be exposed to a pollutant over its averaging time. Long averaging times such as a year mean relevant locations could include schools, houses, hospitals etc. Short averaging times widen the scope, as less exposure time is needed. |

| | |
|---|---|
| **Running Mean** | As an example the air quality standard for Carbon Monoxide is 11.6mg/$m^3$ as a running 8-Hour Mean. To assess measured levels against this standard it is necessary to calculate the average of eight consecutive hourly values, e.g. from midnight to 8:00a.m. then from 1:00a.m. to 9:00a.m. and so on throughout the period of interest. As each calculation of the "Running 8-Hour Mean" gives a result there will be 24 opportunities for the standard to be assessed each day. This will hold true for whether an 8-Hour, 24- Hour or Annual Running Mean is the time period under consideration. |
| **TEOM** | Tapering Element Oscillating Microbalance. Equipment used for measuring fine particulate matter such as $PM_{10.}$ |

Any requests for information about
Air Quality issues within North Lincolnshire,
or requests to obtain a copy of this Report
should be made to the
Environmental Protection Team, Environmental Health Division,
Church Square House, PO Box 42,
Scunthorpe, DN15 6XQ

Telephone 01724 297318
Fax. 01724 297898
Email environmental.health@northlincs.gov.uk
On request, this Policy will be made available on tape, in Braille, large type, or in a language other than English.
This Report is available on the Council's web site:

**www.northlincs.gov.uk**

NORTH LINCOLNSHIRE COUNCIL

**May 2005**