Detailed Assessment Report

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Executive Summary

City of York Council's Progress Report (submitted to DEFRA in April 2008) identified elevated levels of nitrogen dioxide in the vicinity of Fulford Main Street and Heslington Lane. Since the submission of the last Air Quality Progress Report, a real-time monitoring station has been installed at this location.

This report presents the results of this additional monitoring and provides an accurate assessment of the likelihood of the air quality objectives being exceeded at 'relevant ' locations in the area. The report has been prepared in accordance with the Local Air Quality Management Technical Guidance Note LAQM.TG(09).

Real-time and diffusion tube monitoring work undertaken in 2009 has indicated that concentrations of nitrogen dioxide are above air quality objectives values along a short stretch of Fulford Main Street. Based on this detailed assessment and review of the monitoring data within the areas under assessment, the following conclusions are made.

- The declaration of a further Air Quality Management Area (AQMA) is proposed along a section of the A19/Fulford Road corridor. The declaration will be on the basis of nitrogen dioxide (NO_2), where exceedences of the annual mean objective are predicted at relevant receptor locations. The geographical extent of the new AQMA will be subject to consultation with members and local residents.

- To continue monitoring NO_2 at the current monitoring locations in order to ensure that any future changes in air quality are detected, notably locations representative of relevant exposure.

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1.0 Introduction

City of York Council is a unitary authority covering approximately 105 square miles with a population of around 193,000. It lies in the north of England surrounded by the county of North Yorkshire. The City of York Council area is made up of the historic city centre and surrounding urban area, along with a number of villages and semi-rural settlements. A wide expanse of greenbelt separates the city from the neighbouring towns of Harrogate (21 miles), Selby (14 miles) and Malton (19 miles). The nearest cities are Leeds (24 miles) and Hull (37 miles).

The City of York has a flat topology due to its location in the Vale of York at the confluence of the Rivers Ouse and Foss. It is a nationally and internationally prominent city and one of the UK's most visited tourist destinations. York has excellent rail links to the rest of the UK via the East Coast main line and is easily accessed from the main motorway network by the A64 which runs to the south of the city. The historic core is surrounded by an inner ring road linked to the outer ring road via a number of radial routes. At present five of these routes are served by Park and Ride services, with plans for two more. The main shopping area is in the heart of the historic core and is one of the largest pedestrianised centres in the UK. There are three out of town shopping areas located on the outer ring road.

The main source of air pollution in York is traffic. An air quality management area was declared for nitrogen dioxide in 2002 that covers the inner ring road area and some parts of the radial routes leading on to it. There are no major sources of industrial pollution in the City of York Council area. The nearest large industrial emission sources are three power stations Drax, Eggborough and Ferrybridge located between 19km and 25km south of the city.

1.1 Review and Assessment of Air Quality in York

City of York Council completed a First Stage Review and Assessment of Air Quality in December 1998. The report concluded that no further action would be needed to meet the air quality objectives for the following pollutants:

- benzene
- 1,3 butadiene
- lead
- carbon monoxide

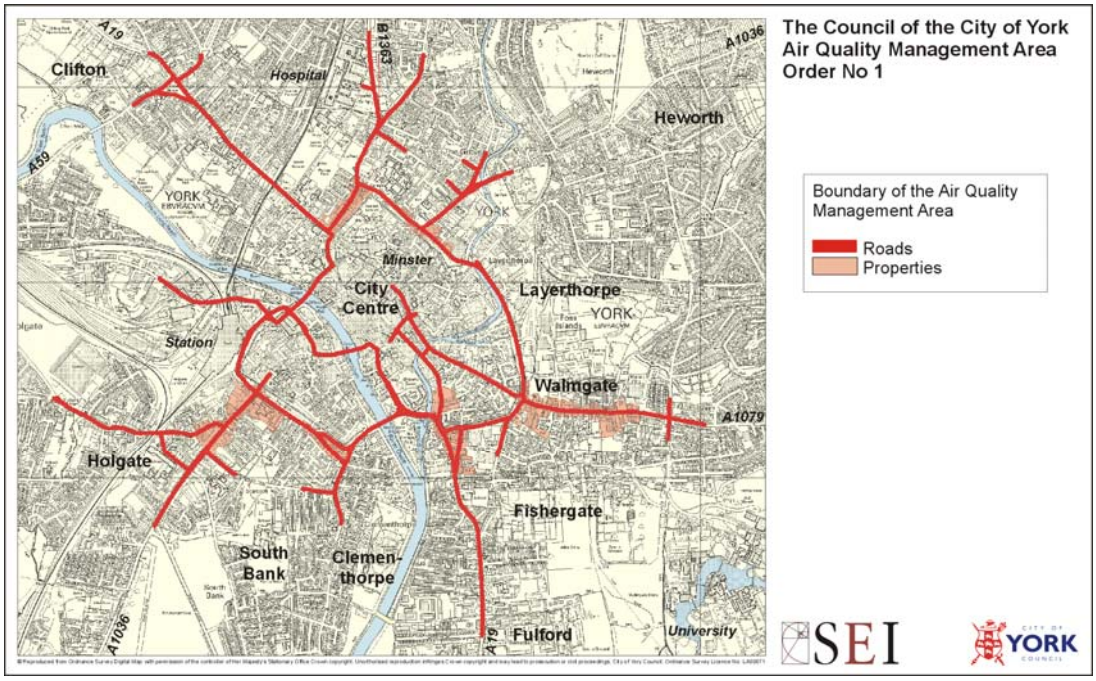
For nitrogen dioxide, sulphur dioxide and PM_{10}, the report concluded that further stages of review and assessment were required.

In February 2000 City of York Council completed a Second and Third Stage Review and Assessment of Air Quality in York[2]. This report concluded that the air quality objectives for sulphur dioxide and PM_{10} would be met, but recommended that an AQMA should be declared due to predicted breaches of

the annual average nitrogen dioxide objective at five locations around the inner ring road.

Following a period of extensive public participatory consultation an AQMA was declared in January 2002 as shown below.

Figure 1 : York's Air Quality Management Area (AQMA)



The declaration of the AQMA in York placed a duty on City of York Council to undertake a Fourth Stage Review and Assessment of nitrogen dioxide concentrations in the city and to submit an Air Quality Action Plan (AQAP) to the Department for the Environment, Food and Rural Affairs (DEFRA). A final Fourth Stage Review and Assessment of Air Quality in York, and an AQAP were submitted to DEFRA in July 2004.

Since the declaration of the AQMA City of York Council has undertaken a number of Update and Screening and Progress Reports. These reports have continually identified breaches of the annual average nitrogen dioxide objective within the existing AQMA. In the most recent Progress Report (April 2008) an additional area of elevated annual average nitrogen dioxide concentrations was identified in Fulford Main Street.

All previous Review and Assessment reports can be viewed online at http://www.jorair.co.uk/index.php?page=reports. Table 1 shows City of York Council's Air Quality Review and Assessment process to date.

Table 1 : City of York Council's Review and Assessment Process

Report date	Report Type	Outcomes
December 1998	First Stage Review and Assessment	Proceed to second stage for NO_2, PM_{10} and SO_2
February 2002	Second and Third Stage Review and Assessment	AQMA required for NO_2 at 5 locations around inner ring road
January 2002	AQMA declaration	AQMA declared
January 2003	Interim Fourth Stage Review and Assessment	Requirement for AQMA confirmed
May 2003	Update and Screening Assessment 1	Detailed assessments needed for SO_2 from trains and PM_{10} from domestic sources
April 2004	Detailed Assessment of SO_2 and PM_{10}	No further assessment of SO_2 and PM_{10} required
July 2004	Fourth Stage Review and Assessment and AQAP1	Source apportionment study and AQAP measures drawn up
April 2005	Progress Report	Continued NO_2 exceedances in AQMA
April 2006	Update and Screening Assessment 1	Continued NO_2 exceedances in AQMA –no requirement for detailed assessment
April 2006	AQAP 2 integrated into LTP2	Integrated AQAP and LTP
April 2007	Progress Report	Continued NO_2 exceedances in AQMA
April 2008	Progress Report	Continued NO_2 exceedances in AQMA. Requirement for detailed assessment for Fulford Main Street identified
April 2009	Update and Screening Assessment	Continued NO_2 exceedances in AQMA and on Fulford Main Street
September 2009	**Detailed Assessment of NO_2 on Fulford Main Street**	**This report**

1.2 Requirement for a Detailed Assessment Report

City of York Council's Air Quality Progress Report, submitted to DEFRA in April 2008, identified a number of monitoring sites outside the existing AQMA where ad hoc elevated concentrations of nitrogen dioxide had been monitored in recent years. One of these sites, viz. Fulford Main Street, had experienced consistently elevated concentrations of nitrogen dioxide for a number of years, and thus a Detailed Assessment of nitrogen dioxide concentrations in this area was required by DEFRA.

The aim of this Detailed Assessment is to determine, with reasonable certainty, whether or not there is a likelihood of the air quality objectives not being achieved on Fulford Main Street. Where a likely exceedence of the objectives is identified, City of York Council are required to determine the magnitude and geographical extent of the exceedance.

2.0 Detailed Assessment for Nitrogen Dioxide

2.1 The National perspective

Nitrogen dioxide (NO_2) and nitric oxide (NO) are both oxides of nitrogen. Together they are collectively referred to as NO_x. All combustion processes produce NO_x emissions, largely in the form of NO which is then converted in the atmosphere to NO_2.

The principal source of NO_x emissions is road transport. Motorways which carry large volumes of high speed traffic are a predominant source, as are roads in congested city centres where there are large volumes of slow moving traffic combined with poor natural dispersion.

The contribution of road transport to NO_x emissions has declined significantly in recent years due to the introduction of tighter vehicle emission standards. Further reductions are expected to occur up to and beyond 2010. For example, urban traffic NO_x emissions are estimated to fall by 46% between 2000 and 2010. Despite a continued reduction in NO_x emissions there has been growing concern in recent years about levels of primary NO_2 emissions from vehicles. Recent research indicates that these are greater than previously recognised and may have increased in some areas as a result of retrofitting particulate emission control equipment to some vehicles.

Other significant sources of NO_x emissions include the electricity supply industry and the commercial sector. Emissions from both these sectors have also been dramatically reduced in recent years due to the introduction of low NO_x burners and the widespread replacement of solid fuel boiler plant with natural gas.

The majority of the 100-plus AQMAs which have already been declared in the UK are based on exceedances of the annual average nitrogen dioxide objective due to traffic emissions.

2.2 The Local Perspective

Following a period of extensive public consultation an AQMA was declared in York on 21st January 2002. The AQMA was declared due to predicted exceedances of the 40$\mu g/m^3$ annual average nitrogen dioxide objective in five locations around the busy inner ring road.

The actual boundaries of the AQMA go beyond the five areas of 'technical breach' and cover all areas where members of the public indicated they would like to see air quality improved. Inside the five 'technical breach' areas property boundaries are included within the AQMA. Outside the 'technical breach' areas only the roads are included in the AQMA. Fulford Main Street is outside the current AQMA.

2.3 Scope of the detailed assessment for nitrogen dioxide on Fulford Main Street

Fulford Main Street currently carries around 20,000 vehicles per day and is often congested. There are no industrial sources of pollution in the area or other activities considered likely to have an adverse impact on local air quality. The area is not in a smoke control area so there may be some influence from domestic smoke emissions.

Figure 2 : Fulford Main Street (near the junction with Heslington Lane)

Fulford Main Street contains a mix of properties with both residential and business uses.

This Detailed Assessment report will focus on the area of Fulford Main Street near to the junction with Heslington Lane. This area is shown in Figure 2 above. This area has been identified, using nitrogen dioxide diffusion tube monitoring, as having the potential to be in breach of the 40$\mu g/m^3$ annual average objective for nitrogen dioxide. Results from the last three years of diffusion tube monitoring are presented in section 3.2.4.

In undertaking the Detailed Assessment it is important to give consideration to the points of maximum relevant public exposure (i.e. those locations where the highest concentrations are expected). Sections 3.3 and 3.4 discuss the methodology used to identify such areas of Fulford Main Street. Sections 3.1 and 3.2 present recent monitoring data for this area. The report concludes with a discussion regarding the likelihood that the air quality objectives are being breached in this area of the city and makes recommendation as to the declaration of a further Air Quality Management Area (AQMA) in this area of the city.

2.4 New real time monitoring equipment on Fulford Road

In October 2008, a new real time monitoring station was installed near to the junction of Fulford Main Street and Heslington Lane. The location of the new monitoring site is shown in Figures 3 and 4 below :

Figures 3 & 4 : Photo and map of Fulford Rd Real-time Monitoring Station

City of York Council looked at many other locations when deciding where to place the unit but this was the only site identified where there was sufficient pavement width to accommodate the unit and access to a suitable power source. The ideal location for the new monitoring station would have been south of the junction, but this was not possible due to due to Highways constraints. City of York Council acknowledge that concentrations of nitrogen dioxide monitored at this location are likely to be less than those monitored further down Fulford Main Street.

The equipment installed consisted of a weatherproof enclosure provided by Casella Measurement and an ML 9841b NO_x analyser with internal zero and span (IZS). The full site received a post commission audit by NETCEN on 26th November 2008, the site was then audited again in January 2009 and was shown to be operating correctly.

To ensure that the air quality data fully complies with the requirements of the review and assessment process, considerable amounts of time and resources have been invested to establish good QA and QC procedures for the air quality monitoring station. The aims of the QA/QC programme were fully detailed in Technical Annex 2: Air Pollution Monitoring in York which was submitted with the Second and Third Stage Review and Assessment of Air Quality in York. The aims of the QA/QC system have not changed since the completion of the Second and Third Stage Review and Assessment of Air Quality in York, but there have been some changes to the service providers.

A comprehensive service and maintenance contract for the new monitoring station at Fulford is held with Casella Measurement. City of York Council have a 48-hour call out agreement with Casella Measurement to ensure that faults are resolved as quickly as possible. Contracts held in relation to the new monitoring station are shown in the table below.

Table 2 : Contracts held in relation to the Fulford Road monitoring station.

Contract	Company
Service and Maintenance	Casella ETI
Data Management	Bureau Veritas
Auditing	NECEN / AEA

The Fulford Road monitoring station has not experienced any significant break-downs or malfunction since the unit began collecting data in January 2009.

3.0 New Monitoring Results

3.1 Real-time monitoring of nitrogen dioxide

LAQM.TG(09) states that for assessment against the annual mean objective for NO_2 it is possible to use data from a shorted period of monitoring , for example, six months consecutive sampling (including three months winter and three months summer), preferably with monitoring commencing in January or July. The guidance note states that a minimum period of three months should always be used.

Data from the new Fulford Road monitoring station, for the period January 2009 to June 2009 (6 months), has been rescaled by the data management contractors (Bureau Veritas). An estimation of the annual mean has been made by factoring the data according to the methodology presented in box 3.2 in LAQM.TG(09). Calculations and results are shown in tables 3 and 4 below.

Table 3 : Estimation of annual mean concentrations from short-term monitoring data

Long Term Site	Annual Mean 2008 μg/m^3 (Am)	Period mean 1/1/08 – 30/6/08 μg/m^3 (Pm)	Ratio (Am/Pm)
Bootham	24.70	26.40	0.935
High Muffles	6.59	6.51	1.013
Barnsley Gawber	18.75	20.56	0.912
		Average (R_a)	0.953

The three long term sites are all background sites and form part of the national network. The annual data capture rates for all the sites are above 90% and thus can be used for the purposes of correcting short-term monitoring data to provide an estimate of an annual mean.

Table 4 below provides summary statistics for the new Fulford Road monitoring station, including an estimate of the annual mean, as calculated using the period to annual correction illustrated above.

Table 4 : Results of real-time monitoring on Fulford Road

Statistic	Result
Nitrogen dioxide 6 month mean (Jan - Jun 2009)	31.1 μg/m^3
Data capture for 6 month mean result	99 %
N^o. of exceedences of 200μg/m^3 (over 6 month period)	0
Maximum hourly concentration (over 6 month period)	119 μg/m^3
Estimation of nitrogen dioxide annual mean (based on period to annual correction for 2008). Adjustment factor = 0.953	**29.6 μg/m3**

Results in table 4 above indicate that both the long-term annual objective and the short-term hourly objectives are unlikely to be breached in this location. The annual average concentration of nitrogen dioxide is well below the objective level of 40 μg/m^3.

It should be noted that due to the positioning of the continuous monitor, City of York Council believe that concentrations of nitrogen dioxide measured at this location on Fulford Main Street are likely to be lower that those present further down the street. As a result, at the start of 2009 it was decided to co-locate three diffusion tubes with the continuous monitor and use the results of this collocation study to calculate a local bias correction figure for the nitrogen dioxide diffusion tubes further down the Fulford Main Street (where historical results have indicated potential breaches of the annual average objective). This is discussed in section 3.2.3.

3.2 Nitrogen dioxide diffusion tube monitoring

Monitoring of NO_2 concentrations using passive diffusion tubes is widely used throughout the UK. Guidance note LAQM.TG(09) acknowledges that , provided care is taken with the storage, handling and analysis of the tubes, and an appropriate 'bias-adjustment' factor is applied, the overall uncertainty of the annual mean is expected to be about +/-20%.

The nitrogen dioxide diffusion tubes used in York prior to 2009 were supplied and analysed by Lambeth Scientific Services, Arlington Lodge, 26 Wanless Road, London, SE24 OHW. City of York changed laboratory in January 2009 and now uses Harwell Scientifics.

The preparation method used for the diffusion tubes was 50% TEA in Acetone. All diffusion tube laboratories used by City of York Council confirmed that they could adhere to the best practice guidance provided in the 'Diffusion Tubes for Ambient NO_2 Monitoring: Practical Guidance for Laboratories and Users'.

The accuracy of the diffusion tubes are monitored on a month by month basis by co-locating diffusion tubes with the inlets to four of the real time chemiluminescence analysers operated in the city. The precision of the diffusion tubes are monitored by co-locating three diffusion tubes at seven sites in the city. The methodology used to calculate the accuracy and precision of the diffusion tubes in York was fully documented in 'Technical Annex 2: Air Quality Monitoring in York' , submitted with the Second and Third Stage Review and Assessment of Air Quality in York.

Bias correction factors for the 2008 calendar year were presented in Appendix 4 of the Update and Screening report submitted to DEFRA in April 2009. Calculation of a local bias correction factor for Fulford Road in 2009 is discussed in section 3.2.3.

3.2.1 Locations of diffusion tubes in the vicinity of Fulford Main Street

The locations of all diffusion tubes in the vicinity of Fulford Main Street are shown in figure 5 below.

Figure 5 : Locations of diffusion tubes in vicinity of Fulford Main Street

3.2.2 Estimation of Fulford Road diffusion tube annual mean nitrogen dioxide concentrations

In order to assess the likelihood of the annual average nitrogen dioxide objective being exceeded in 2009 along Fulford Main Street, it is necessary to estimate an annual mean for each of the diffusion tubes in this area.

As City of York Council changed diffusion tube suppliers at the beginning of 2009 it would be unwise to adjust the short-term concentrations (Jan to June 2009) using longer term concentrations monitored by diffusion tubes in previous years. As such, the period to annual correction factor calculated in section 3.1 for correction of the Fulford Road real-time monitoring data has been used for this purpose.

By adopting this approach, the correction also avoids any very local effects that may occur at roadside sites (as may occur when using roadside diffusion tubes in the vicinity of Fulford Main Street for the period to annual adjustment).

Table 5 : Diffusion tube period to annual correction

Tube reference	Six month mean (μg/m^3) (Jan to June 09) [Pm]	Estimated annual concentration (μg/m^3) [Pm x 0.953]
C36	41.77	39.80
C37	32.88	31.34
C38	44.44	42.35
C39	51.63	49.21
C58 (formerly C50)	63.09	60.13
96	36.43	34.72
95a	37.75	35.98
95b	36.83	35.10
95c	37.34	35.59

Before tube data can be compared with objective values, the annual mean estimates must be adjusted for bias. This has been done by calculating a local bias correction factor as described in section 3.2.3 below.

3.2.3 Calculation of a local bias correction factor for Fulford Road diffusion tubes

LAQM.TG(09) acknowledges that there is no straightforward answer as to whether it is better to use a bias-adjustment factor derived from the national database of co-location studies, or from a single co-location study. It does state, however, that a locally obtained bias adjustment factor may be more representative where the duration of the whole diffusion tube study is less than one year, especially if it is less than nine months (where adjustment is best made for a matched time period, rather than using an annual factor). For the purposes of this study, a local bias correction factor has been calculated based on a six month co-location study at the Fulford Road real-time monitoring station.

The methodology used to calculate the accuracy of the diffusion tubes in York was fully documented in 'Technical Annex 2: Air Quality Monitoring in York' , submitted with the Second and Third Stage Review and Assessment of Air Quality in York. Details of the calculations undertaken to obtain the bias correction factors used in this report can be found in Appendix A : Bias correction factors.

The estimated diffusion tube annual average nitrogen dioxide concentrations (as calculated in section 3.2.2 above) have been corrected for bias and are displayed in the table below.

Table 6 : Estimate of bias corrected annual average diffusion tube data for the area around Fulford Main Street.

Tube reference	Estimate of 2009 bias corrected annual average nitrogen dioxide concentrations ($\mu g/m^3$)
C36	33.00
C37	25.98
C38	35.11
C39	40.79
C58 (formerly C50)	49.85
96	28.78
95a	29.83
95b	29.10
95c	29.50

Concentrations of nitrogen dioxide monitored by diffusion tubes C39 and C58 are estimated to be above the objective value of $40\mu g/m^3$ in 2009. These two tubes will be carefully monitored over the coming months.

3.2.4 Diffusion tube data – trend analysis

Table 7 below show the bias corrected, annual average concentrations of nitrogen dioxide as monitored by tubes in the vicinity of Fulford Main Street. The figures proved for 2009 are bias corrected estimates based on the period to annual correction undertaken in section 3.2.2.

Table 7 : Diffusion tube monitoring results for Fulford Main Street.

Tube reference	Bias Corrected Annual Average (μg/m^3)			
	2006	2007	2008	2009*
C36	33 (37)	33 (36)	35 (37)	33
C37	22 (25)	29 (32)	31 (33)	26
C38	34 (38)	31 (34)	35 (38)	35
C39	40 (46)	33 (37)	40 (42)	41
C58 (formerly C50)	50 (56)	46 (50)	52 (55)	50
96	-	-	-	29
95a	-	-	-	30
95b	-	-	-	29
95c	-	-	-	30

***** Figures provided for 2009 are estimated based on methodology in LAQM.TG(09)
(x) Upper 95% confidence limit shown in brackets after the annual average

Concentrations of nitrogen dioxide monitored at sites C39 and C58 (formerly C50) have been consistently above objective levels for several years. These have been highlighted in red in the table above.

The diffusion tubes results have indicated the potential breach area to be the section of Fulford Main Street near the junction with Heslington Main Street.

Sections 3.3 aims to identify potential breach areas along this stretch of Fulford Main Street. Section 3.4 estimates population exposure in the area identified as being in breach of the annual average nitrogen dioxide objective.

3.3 Identification of potential breach areas

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 likely to regularly present". It is important that Review and Assessments focus on those locations where members of the public are likely to be regularly present and are likely to be exposed for a period of time appropriate to the averaging period of the objective.

For an annual mean averaging period, the air quality objectives should apply at all locations where members of the public might be regularly exposed. Building facades of residential properties, school, hospitals and care homes would all be relevant in terms of long-term annual mean objectives.

Potential breach areas have been estimated by looking at the Council's Geographic Information System (GIS) and undertaking a number of site visits. Possible areas of relevant exposure are shown on figure 6 below.

Figure 6 : Minimum likely area of exceedence

Properties in this area of Fulford Main Street have been identified as having the potential to be exposed to elevated levels of nitrogen dioxide based on recent diffusion tube monitoring in the area. Concentrations of NO_2 as monitored by diffusion tubes outside the highlighted area have not highlighted any issues with regard to the annual average nitrogen dioxide objective (e.g. diffusion tubes C38 and C37 have been well under the annual average objective level for the last three years). The number of residents within the potential breach areas is estimated in section 3.4 below.

3.4 Estimating population exposure

Within their Detailed Assessments, local authorities are required to estimate the number of people exposed to pollutant concentrations above the objectives, and the maximum pollutant concentration (measured or modelled) at a relevant receptor location. This information is required to help DEFRA and the devolved administrations quantify the health benefits of improving air quality within the LAQM regime.

DEFRA acknowledge that it is not feasible to take into account subtleties such as transient exposure (e.g. at schools) or exposure at different heights within these assessments, and authorities should assume that the residential population is representative of exposure within the exceedence area.

Total relevant exposure has been estimated within the Fulford Main Street / Heslington Lane junction using City of York Council's Geographic Information System (GIS) and by undertaking a number of manual surveys during site visits. The information is shown in table 8 below.

Table 8 : Estimated number of residential properties located within predicted area of exceedence.

Area	Residential Properties (including first floor flats)	Equivalent population (N^{o}. Properties x 2.5)
Predicted possible area of exceedence	33	83

4.0 Conclusions and recommendations

A detailed assessment has been carried out for the area of Fulford Main Street near the junction with Heslington Lane. This area was identified in City of York Council's most recent Update and Screening and Progress Report as having the potential to be in breach of the annual average objective for nitrogen dioxide.

Diffusion tube monitoring work has indicated that concentrations of nitrogen dioxide are above air quality objectives values along a short stretch of Fulford Main Street. Real-time monitoring at the junction of Fulford Main Street and Heslington Lane has not indicated any potential breaches of the annual average objective for nitrogen dioxide and the extent of the exceedence appears to be limited to Fulford Main Street itself. Based on this detailed assessment and review of the monitoring data within the areas under assessment, the following recommendations are made.

- The declaration of a further Air Quality Management Area (AQMA) is proposed along this stretch of the A19/Fulford Road corridor. The declaration will be on the basis of NO_2, where exceedences of the annual mean objective are predicted at relevant receptor locations. The geographical extent of the AQMA will be subject to consultation with members and local residents.

- Monitoring of NO_2 at the current monitoring locations will continue to ensure that any future changes in air quality are detected, notably locations representative of relevant exposure (i.e. facades of residential properties).

- Additional monitoring work will be presented as part of a 'Further Assessment' report, required within 12 months of designating the new AQMA. Additional monitoring data for 2009 will be used to support the conclusion to declare a further AQMA; to corroborate the assumptions on which the AQMA will be based, and to check that the original designation is still valid and does not need amending in any way. The Further Assessment will also discuss the implementation of the Fulford Road corridor study measures (an ongoing local traffic management scheme).

- DEFRA acknowledge a close link between the preparation of the Further Assessment and the Air Quality Action Plan, and expect that these would normally be taken forward in parallel following the declaration of the AQMA.

Appendix A :
Calculation of a Local Bias Correction Factor

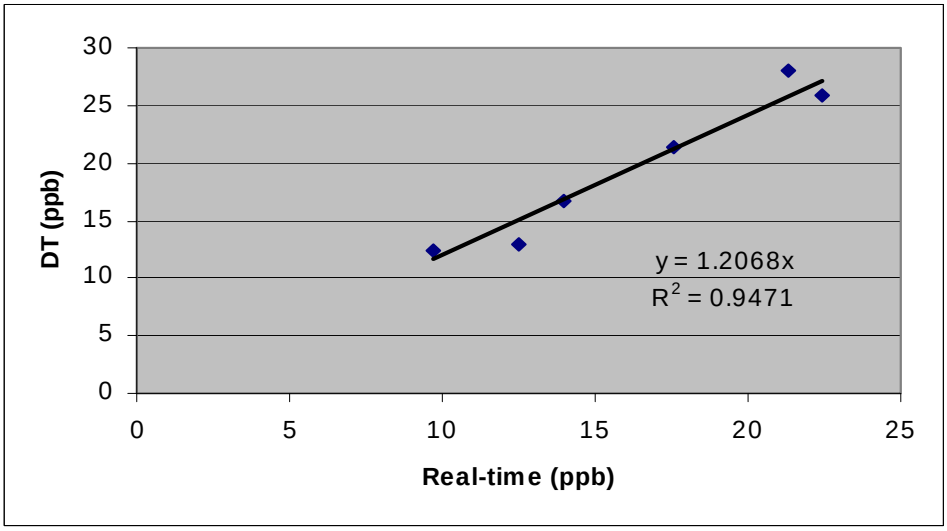
Introduction

As part of the Second and Third Stage Review and Assessment of Air Quality in York a detailed discussion of the accuracy and precision of diffusion tubes was included in Technical Annex 2: Air Quality Monitoring in York. This included a detailed description of how to calculate accuracy and precision factors for diffusion tubes.

For the purpose of this Detailed Assessment report, a local bias correction factor has been calculated based on a 6 six month co-location study at the Fulford Road real-time monitoring station. The methodology used to calculate these factors is the same as that outlined in Technical Annex 2 of the Second and Third Stage Review and Assessment of Air Quality in York and the reader should refer to that document for further information.

Calculation of Accuracy Factors

Accuracy factors are calculated from the results obtained from diffusion tubes co-located with real time chemiluminescence analysers. To calculate the bias of the diffusion tubes, scatter plots of chemiluminescence data versus diffusion tube data for the Fulford Road monitoring sites were plotted. A y=mx line of best fit was applied to the resultant scatter plot. The gradient of the line, m was taken as the bias factor.



The bias factor for the tubes located at the Fulford Road monitoring site was found to be 1.207, demonstrating that in general the diffusion tubes overestimated the nitrogen dioxide concentrations at the roadside site. For the purpose of this Detailed Assessment report, bias corrected averages for roadside monitoring sites have been calculated by decreasing the annual average figure for each site by 17.1%.