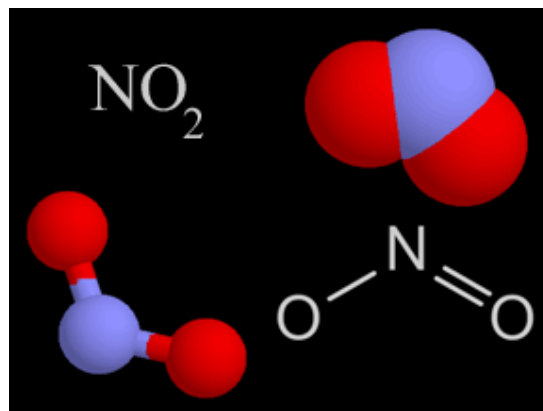


Community Air Pollution Monitoring 2008 and 2009 Measuring Nitrogen Dioxide Using Diffusion Tubes

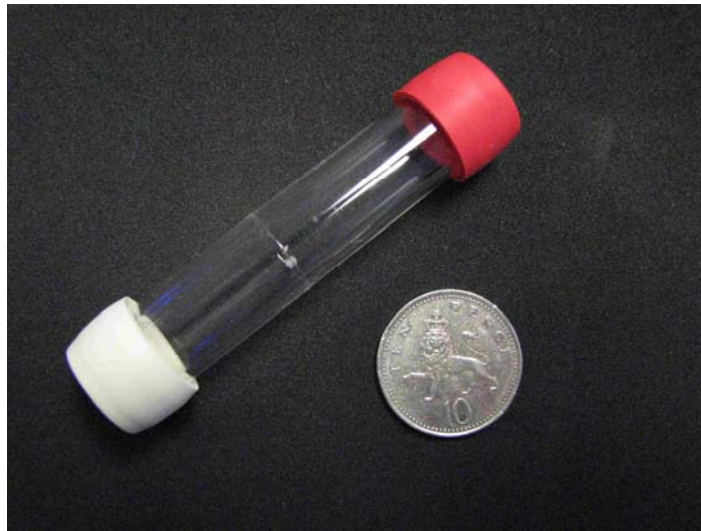
Report by Adam Swift, Carbon Reduction and Air Quality Team,
Sheffield City Council
and
Neil Parry and Barbara Rimmington
East End Quality of Life Initiative

February 2010



1.0 Introduction

Air pollution is considered to be responsible for up to 24,000 premature deaths throughout the United Kingdom annually. Local Authorities have a role to play in monitoring and reporting local levels of air pollution to the Department for Environment, Food and Rural Affairs (DEFRA) and creating Air Quality Management Areas where levels exceed European Objectives. A low cost method for the measurement of air pollution are diffusion tubes. The gas measured is nitrogen dioxide, which is often used as an indicator of general air pollution.



Since 1998 the residents of Sheffield have undertaken monitoring of Nitrogen Dioxide through the Community Diffusion Tube scheme; with tubes being exposed monthly at a large number of sites all over the City. The results from this monitoring, combined with the results from the Council's own tubes, and those funded by the Local Transport plan mean that there is a fantastic knowledge of air quality all over the area.

The rationale behind the Community scheme is that the participants are best placed to know the locations in their neighbourhood where there are concerns about air pollution. This brings the issue of air pollution down to local level. People are able to use these results to highlight the effects that traffic in their community could be having on their health and well-being.

The Carbon Reduction and Air Quality Team (formerly Environmental Strategy) within Sheffield City Council have managed successfully to apply to DEFRA for funding through the annual Air Quality grant. This funding has enabled meant we can:-

- i. Fund the supply and analysis of tubes.
- ii. Co-ordinate the collection and storage of monitoring results.
- iii. Report on results.

Thanks must go to the groups involved in collecting the data; in the year covered by this report they were:-

Heeley Development Trust
Foxhill Forum
Green City Action in Firvale and Burngreave
Broomhall Forum
Nether Edge Forum
Brinsworth and Catcliffe
Handsworth Forum in Handsworth and Darnall
Greenhill
Kelham Island
Burngreave/Melrose
Crookes
King Egbert School
Abbeydale Grange School
Breath Easy Group

New groups for last year (2009) were:-

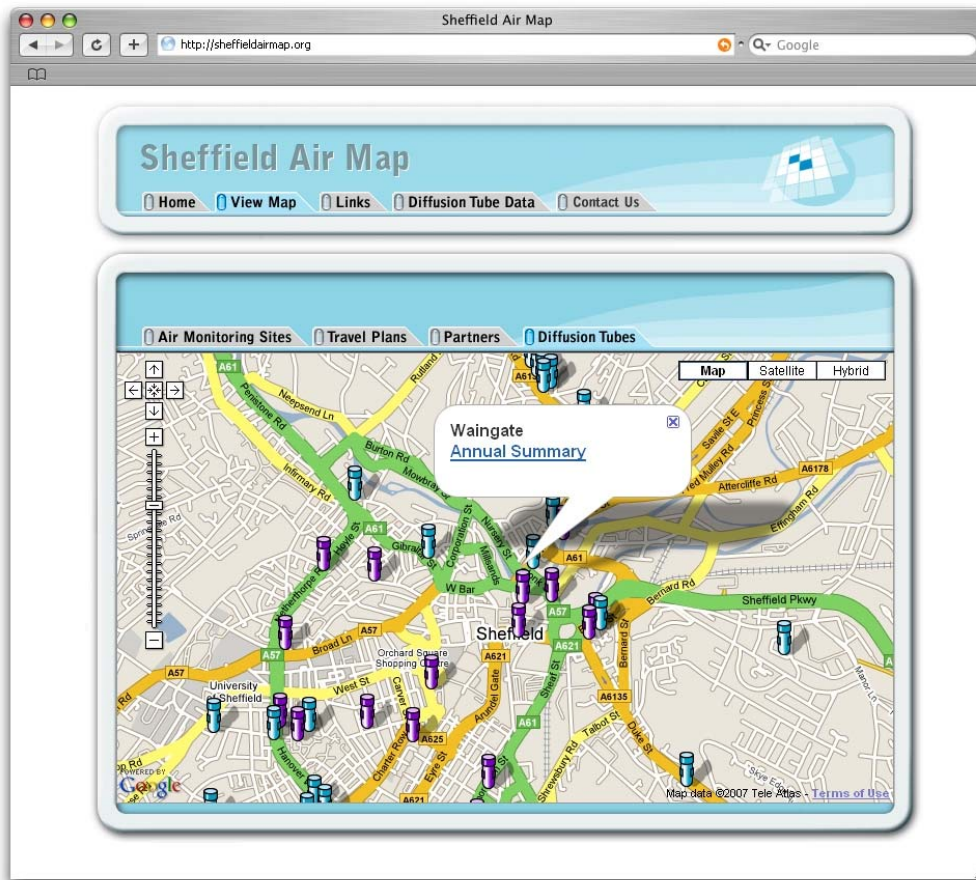
Brinsworth Comprehensive School
Brunswick School
Deepcar/Stocksbridge
Lower Arbourthorne
Lynwood Gardens
Penistone Road
Single tubes at Hinde House Lane, Derbyshire Lane and Winchester Ave

With the proposed Smartroute Scheme on Penistone Road, the tubes located in this area could give valuable 'before' and 'after' results to give a picture of whether the road alterations have affected the air quality at all.

East End Quality of Life initiative is a long standing community based project which is funded by NHS Sheffield (the Primary Care Trust for Sheffield). The Initiative continues to support community groups in the month-by-month monitoring of nitrogen dioxide, but also provides detailed feedback in the form of regularly updated graphs which they can use to raise concerns about health and quality of life in their local communities. Graphs showing community air quality monitoring results have been published on the East End Quality of Life Initiative's website <http://www.sheffieldeastend.org.uk/AQmonitoring.htm> to allow immediate access for anyone interested in Sheffield's air quality. Participating schools also receive the full data files for use in their school's curriculum.

The annual bias adjusted results collected by the community groups are being displayed on the website at <http://sheffieldairmap.org>. The site contains information on the location each diffusion tube and the annual mean nitrogen dioxide level for each year. The website has undergone some modifications in the past year and now includes details of the Car Club reserved parking spaces, and locations where alternative fuels are available. It should be noted that the annual results are not added to the website until they have been

bias adjusted. This involves siting duplicate tubes at some of our real time monitoring stations and comparing the diffusion tube results with the results from the more accurate monitors. The difference between the two results is used as the bias adjustment.



The data that is on the website is accessed by a number of users – people interested in their local area, schools, universities and consultants.

The Care4Air website now has a section dedicated to the 21st Century Science curriculum that covers Air Quality as part of their course. The students are given real diffusion tube data and asked questions regarding the analysis of the results.

There are also sections on 'Air pollutants', 'Measuring air pollutants', 'Using diffusion tubes', 'Using air quality data' and 'Greenhouse gases'. This section of the Care4Air site also contains a couple of air quality related games.

Activity 1 - Checking that Government targets are being met

Using diffusion tubes

The table below shows a list of sites in Sheffield where diffusion tubes have been located to measure nitrogen dioxide. The diffusion tubes are attached to lamp posts and road signs.

You will notice that sometimes, the data from each tube is not available due to either the tube being vandalised, blown away in strong winds or the stopper at the end of the tube not being removed.

Other times the data appears inaccurate due to a large source of pollution being temporarily sited near the tube, for example during road works or a construction site. Excessive dust can also contaminate the inside of the tube making it impossible to analyse.



Each tube has been left outdoors to collect a sample of the nitrogen dioxide in the air for one month at a time. The mean for the year is then calculated from these results and is used by Sheffield City Council to see if the site is within the UK Government's air quality target for nitrogen dioxide of an average of 40 micrograms per cubic metre of air for any single year.

To do:

- Work out the mean for each site for the year?
- Suggest why there is a range of averages?
- Suggest why the tube sited at Scotland Street has a high reading in September and explain why this reading should be treated as an outlier and not used when calculating the mean reading for Scotland Street?
- Suggest why some of the tubes have "no data", "missing" or "tube not properly exposed" in the table?
- Find out which sites are above the Government target for the year?

Site	Jan	Feb	Mar	April	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Barnsley Rd	36	48	49	51	47	59	43	42	42	53	48	51
Upwell Street	33	39	45	53	48	57	36	39	No data	63	No data	52
Burngreave Road	35	46	38	42	41	41	41	37	38	50	51	28
Exchange Street	41	56	42	45	42	46	44	45	43	54	47	49
Duke Street	49	54	52	54	51	52	51	51	52	59	58	62
Waingate	46	55	52	64	51	60	41	51	41	64	54	59
Fitzalan Square	48	60	59	59	54	63	55	55	No data	6	68	68
Barkers Pool	26	36	35	33	No data	31	29	25	No data	44	Tube not properly exposed	38
Scotland Street	24	33	22	28	27	28	26	25	572	38	33	35

Nitrogen dioxide results from diffusion tubes - Sheffield 2007, shown in micrograms per cubic metre of air ($\mu\text{g m}^{-3}$)

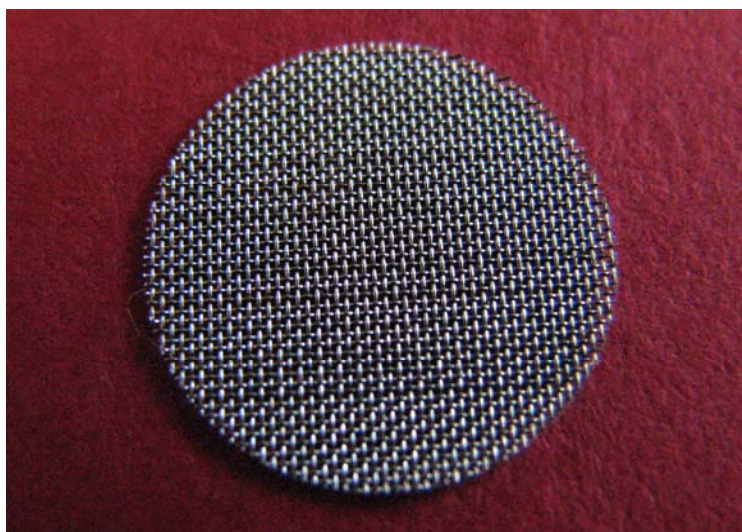
The current analysis laboratory, South Yorkshire Labs is unfortunately being closed by Sheffield City Council. The lab has provided the analysis for the diffusion tubes for the past 11 years, and thanks must go to Andy Hawkins, Malcolm Duncan and Martin Clarke for their efforts in sorting out the sometimes challenging results sheets that we've all sent in from time to time. Andy is setting up a new venture, South Yorkshire Air Quality Samplers (SYAQS) with the intention of providing a continuity of service for any interested parties. We have decided that, for financial and continuity reasons, the Community Diffusion Tube samplers should be provided by SYAQS and we are currently proceeding with the ordering process. We look forward to working with Andy in the future.

2.0 Method

The method used to measure nitrogen dioxide levels by diffusion tube was as described in DEFRA guidance (Part iv of the Environment Act 1995 Local Air Quality Management- Technical Guidance- LAQM.TG(03)).

This guidance was closely followed to ensure the quality assurance of the results.

In the diffusion tube monitoring method, open ended (bottom) tubes are left in the open air for a period of about a month, during this time nitrogen dioxide is absorbed onto a chemical supported on a metal grid in the tube. The times and dates of exposure are recorded and reported to the analysing laboratory. The tubes are then sealed and sent for analysis.



In these particular tubes the absorbing chemical is triethanolamine (50% TEA in acetone). Nitrogen dioxide, absorbed as nitrite by triethanolamine, is determined spectrophotometrically (u/v visible at 540 nanometres). Nitrite reacts with the added reagent to form a reddish purple azo dye. The optical density of this complex is then measured by spectrophotometer.

Concentration in air is then calculated from a precalibrated response factor and exposure times. The values are blank corrected using laboratory blank values. A bias adjustment factor is determined (as described in the guidance) by co-locating tubes with automatic nitrogen dioxide analysers. In 2005 this figure was taken as a mean of several national studies (including studies done in South Yorkshire). Diffusion tube results can be compared with audited values from automatic nitrogen dioxide results. The bias adjustment factor can then be applied to all the laboratory reported nitrogen dioxide concentrations. The monthly (bias adjusted) concentration results are averaged over a year period to produce an annual mean value. This value can be then compared to the DEFRA nitrogen dioxide annual mean objective (for 2005) of $40 \mu\text{g}/\text{m}^3$.

3.0 Results and Discussion

Table 1 in the appendix shows the quality assured (bias adjusted) annual mean nitrogen dioxide levels for 2004 to 2009, for the Community Diffusion Tubes, together with the tube locations.

Table 2 shows the city wide results for the tubes changed by the CRAQ team at Sheffield City Council, and Table 3 shows the results for the tubes that are funded by the Local Transport Plan (LTP) and changed by the CRAQ team – their inclusion in this report is to give the widest picture possible of the air quality in the Sheffield area.

The bias adjustment factors used for the community and LTP tubes supplied by South Yorkshire Laboratory were:-

2004 – 0.90
2005 – 0.96
2006 – 1.03
2007 – 1.08
2008 – 0.98
2009 – 0.95

The tubes used for the Sheffield City Council survey are provided by a company called Gradko and these have different bias adjustment figures. They are:-

2003 – 1.10
2004 – 1.10
2005 – 1.11
2006 – 1.04
2007 – 1.03
2008 – 0.93
2009 – 1.02

The objective of $40 \mu\text{g}/\text{m}^3$, as an annual mean, is often breached. Ten tubes in 2004, nine in 2005, eleven in 2006, eleven in 2007 and eight in 2008 either equal or breach the objective.

The highest value in 2004 of $53 \mu\text{g}/\text{m}^3$ was recorded at Town Street, Tinsley adjacent to Bawtry Road and the M1. Levels continue to be raised at this location with an improvement during 2005 to $43 \mu\text{g}/\text{m}^3$, but worsening during 2006 and 2007 to 51 and $53 \mu\text{g}/\text{m}^3$; values during 2008 falling slightly to $47 \mu\text{g}/\text{m}^3$.

London Road was the site with the highest recorded level in 2005, at $50 \mu\text{g}/\text{m}^3$. The levels have remained high at this site, with subsequent years being measured at 59, 62 and $53 \mu\text{g}/\text{m}^3$. The indicated value of $62 \mu\text{g}/\text{m}^3$ during 2007 along with similar values at Fitzalan Square and Witham Road (Crookes) has meant the Council needs to extend the scope of the existing Air Quality Management Area to include hourly as well as annual nitrogen dioxide emissions.

The highest level in 2006 was $82 \mu\text{g}/\text{m}^3$ at Lady's bridge. The levels were also at the top of the list in 2007, at $77 \mu\text{g}/\text{m}^3$, but with the opening of the inner relief road the values fell during 2008 to give an annual average of $43 \mu\text{g}/\text{m}^3$. The reading for 2008, whilst still being above the DEFRA objectives, was a marked improvement brought about by moving the source of the pollution away from the receptors.

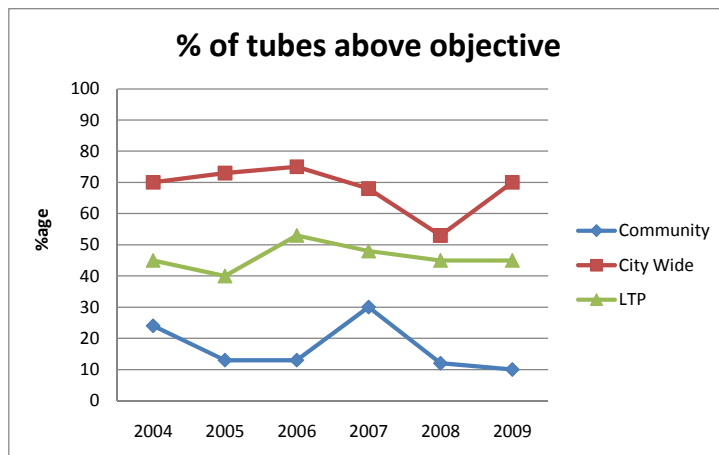
The highest value during 2008 was at Witham Road, Crookes; funding for this site comes from the Local Transport Plan. The levels, whilst lower than previous years was still at $58 \mu\text{g}/\text{m}^3$.

As these tubes are largely in gardens or next to houses, it is apparent that large numbers of people are living in areas of Sheffield, which are subject to unhealthy levels of nitrogen dioxide. Contrary to forecasts of falling NO₂ levels from Government Departments, due to the implementation of cleaner technology in new vehicles (Euro Class), the values recorded are fluctuating with no clear overall trend.

The City Wide tubes show considerable amounts of NO₂ are being monitored across the whole of the city. Five sites returned figures of over $40 \mu\text{g}/\text{m}^3$ in 2009 that were under the objective in 2008; 70% of the tubes exposed in 2009 were above the objective. The highest result was at Waingate, a steep route into the city with a number of bus stops close to the monitoring site. The previous year's highest result was also in the city centre at Fitzalan Square, an area where there are numerous busses and taxis and with traffic coming into the centre being stopped at traffic lights nearby. In the citywide study shown in Table 2 most tube locations were chosen in areas where there are high levels of traffic with residential properties nearby. The few exceptions were at sites called AUN and ACE which were tubes co-located with automatic monitoring stations. There were also some tubes located in the city centre for example Barkers Pool where there are no residential properties.

For the S10/Chesterfield Road study the locations (shown in Table 3) were largely roadside and did not necessarily correspond to areas of residential properties.

The graph below shows the number of tubes exceeding the limit as a percentage of the total number of tubes exposed for each of the schemes.



4.0 Conclusion

- i. The Community Diffusion Tube scheme continues to be run by the East End Quality of Life Initiative which is funded by NHS Sheffield. Sheffield City Council fund the supply and analysis of tubes. The scheme is now in it's eleventh year and is often used as an example of best practice.
- ii. The data provided by the scheme is invaluable as it helps to give a broad picture of the pollution problems being faced in areas of the City not covered by the Council's own monitoring.
- iii. The data being collected by the scheme continues to be very beneficial in the continuing Review and Assessment of air quality, which all Local Authorities are bound to carry out, in particular the Penistone Road monitoring that has started prior to the implementation of the 'Smartroute' scheme
- iv. The results generated by the scheme point to raised levels across the City (many of the tubes are in locations which breach Government objectives). This indicates that many people are living in polluted areas.
- v. The raised levels of nitrogen dioxide measured by the diffusion tubes continue to be associated with high traffic levels.
- vi. The scheme gives the participating community groups valuable information about their area which in turn empowers local communities to better articulate their concerns about poor air quality
- vii. The Sheffield Air Map website continues to be developed, with Car Club locations and Alternative Refuelling points being added in the last year.
- viii. The new laboratory, South Yorkshire Air Quality Samplers run by Andy Hawkins, has taken over the analysis of the tubes from the start of this year. Hopefully things will transfer smoothly, but if there are any teething problems we ask that you bear with us whilst they are rectified.

5.0 Future Work

- i. As DEFRA funding has been secured for 2009-10, the diffusion tube project will be continued at least for another year and may be expanded into more areas if willing groups can be located. Anyone interested in joining the scheme should contact Neil Parry on 0114 – 2859911 or e-mail neil@sheffieldct.co.uk .
- ii. Annual reports for future years will be produced.
- iii. An annual meeting of community groups will be organised, with a review of the latest bias adjusted results.
- iv. The website <http://sheffieldairmap.org> will be developed further. Ideas for the continued improvement of the site are welcomed – suggestions can be made to adam.swift@sheffield.gov.uk . The coming year could see the website merging with the Sheffield Clean Air Partnership for a single point of access to a number of Air Quality related reports and information regarding air quality within the Sheffield area.

6.0 Acknowledgement

The continued participation by the community groups and individuals is greatly appreciated by the CRAQ Team. The success of this monitoring programme has been reliant on the work carried out monthly by the volunteers and, whilst we occasionally lose a group, the numbers of tubes being exposed continues to rise. The coordinating roles of Neil Parry and Barbara Rimmington of the East End Quality of Life Initiative are crucial to the smooth running of the scheme, and their continued participation ensures the future of the scheme is in good hands. As ever we would encourage participants to recruit new groups to the scheme, especially in areas where there is little existing coverage such as the Chapeltown and Beighton areas.

Table 1

Site	Annual Mean NO ₂ µg/m ³ 2004	Annual Mean NO ₂ µg/m ³ 2005	Annual Mean NO ₂ µg/m ³ 2006	Annual Mean NO ₂ µg/m ³ 2007	Annual Mean NO ₂ µg/m ³ 2008	Annual Mean NO ₂ µg/m ³ 2009
Brinsworth and Catcliffe						
Pringle Road Brinsworth	32	27	28	-	27	28
Broadway Brinsworth	36	27	28	-	31	30
Grange Farm Close	42	39	39	-	42	42
Catcliffe Junior School	37	26	24	-	25	26
Highfield View Catcliffe	32	27	28	-	29	29
Main Street Catcliffe	34	31	27	-	30	30
Sheffield Lane	30	29	26	-	25	26
Brinsworth Road	40	35	38	-	37	36
Derwent Crescent	-	47	52		53	55
St. David's Drive	-	27	26		29	30
Handsworth and Darnall						
Highfields Highfield Lane	35	35	28	35	30	28
St Mary's Church	38	36	32	40	32	32
Fitzallan Road Handsworth	29	30	25	28	26	24
Rosy's Richmond Park Road	29	28	23	30	25	23
Handsworth Road	42	39	35	42	38	38
Handsworth Road	40	38	35	43	39	37
Shop Front Parkway R/A	43	43	38	44	39	40
Greenwood Crescent	31	27	25	-	25	23
Prince of Wales Road	27	27	23	28	25	24
Greenland Junior School	29	29	26	31	26	25
Greenland Junior School	30	30	26	29	27	25
Greenland Court	25	30	21	26	24	21
Darnall Medical Centre	34	34	27	33	31	29
Nursery Handsworth Road	33	32	28	34	30	28
Norfolk Arms	33	31	26	32	26	32
Athelstone School		29	23	27	23	21
Ballifield School		30	32	39	34	32
62 Rotherham Road		32	35	38	34	34

Table 1 - ctd.

Site	Annual Mean NO ₂ µg/m ³ 2004	Annual Mean NO ₂ µg/m ³ 2005	Annual Mean NO ₂ µg/m ³ 2006	Annual Mean NO ₂ µg/m ³ 2007	Annual Mean NO ₂ µg/m ³ 2008	Annual Mean NO ₂ µg/m ³ 2009
Heeley						
Ann's Grove School	25	23	-	-	-	-
Chesterfield Road	50	43	52	-	-	-
Heeley Green	33	29	-	-	-	-
Myrtle Road	24	20	22	26	21	22
Heeley Bank Road	39	33	36	42	35	34
London Road	53	50	52	53	-	-
Daresbury Road	-	-	-	28	25	27
East Bank Road	-	-	-	30	26	25
Foxhill Forum						
Wolfe Road	17	20	18	20	17	21
Keats Road	18	16	18	18	16	16
Foxhill Medical Centre	19	22	23	23	20	21
Birley Carr Church	19	19	18	20	16	17
Chaucer School	19	19	23	23	21	16
Neepsend						
Gardener's Rest	27	30	-	-	-	-
Brooklyn Works	31	27	-	-	-	-
Kelham Island Tavern	25	31	-	-	-	-
Rutland Road	40	39	-	-	-	-
Borough Mews	28	19	-	-	-	-
Greenhill						
Westwick Crescent	17	16	18	18	16	14
Key Homecare	24	21	22	24	21	20
St Peter's Church	19	18	17	21	18	17
Greenhill Library	20	19	21	23	20	18
Bocking Lane	25	24	23	28	24	23

Table 1 - ctd.

Site	Annual Mean NO ₂ µg/m ³ 2004	Annual Mean NO ₂ µg/m ³ 2005	Annual Mean NO ₂ µg/m ³ 2006	Annual Mean NO ₂ µg/m ³ 2007	Annual Mean NO ₂ µg/m ³ 2008	Annual Mean NO ₂ µg/m ³ 2009
Burngreave						
Abbeyfield Park House	25	25	24	25	23	-
Burngreave Road	34	34	30	41	32	-
Scott Road	29	28	28	30	27	-
Firhill School, Barnsley Road	29	28	30	31	25	-
Barnsley Road	34	35	33	39	35	-
Tinsley						
Town Street	53	43	51	53	47	45
Seimens Close	46	43	48	47	43	40
Greasebro Road	40	42	41	44	39	35
Ferrars Road	37	38	33	37	31	28
Ingfield Avenue	44	39	40	37	36	34
Sheffield Road	-	-	38	38	35	33
Ferrars Road	-	-	31	33	35	35
Ferrars Road	-	-	32	32	33	30
Junior School Building	-	-	-	-	-	40
Junior School Field	-	-	-	-	-	43
Kelham Island						
Wicker	-	-	43	41	42	38
Ladys Bridge	-	-	82	77	44	42
Gibraltar Street	-	-	37	41	34	34
Penistone Road	-	-	46	55	49	51
King Ecgbert School						
Back of School	-	-	13	14	12	12
Car park	-	-	15	18	16	16
Top of drive	-	-	16	17	16	15
Tesco Express Abbeydale Rd	-	-	29	31	27	27
Ashfurlong Road	-	-	14	15	13	13

Table 1 - ctd.

Site	Annual Mean NO2 µg/m3 2004	Annual Mean NO2 µg/m3 2005	Annual Mean NO2 µg/m3 2006	Annual Mean NO2 µg/m3 2007	Annual Mean NO2 µg/m3 2008	Annual Mean NO2 µg/m3 2009
Firvale						
Earl Marshall Youth Centre	26	27	32	28	25	-
Firth Park Road	35	-	28	-	-	-
Owler Lane 1	40	42	38	43	36	-
Owler Lane 2	34	34	36	38	32	-
Barnsley Road	42	41	36	42	38	-
Broomhall						
Ruth Square	-	21	21	24	20	27
Broomhall Road	-	21	27	26	26	25
Hanover Methodist church	-	26	28	30	25	24
Springfield Street	-	22	25	25	24	25
56 Exeter Drive	-	26	29	27	24	18
126 Exeter Drive	-	36	36	30	28	23
103 Exeter Drive	-	26	25	-	-	-
Burngreave/Melrose	-	-				
120 Burngreave Road	-	-	34	40	29	25
104 Burngreave Road	-	-	35	40	33	25
86 Burngreave Road	-	-	35	41	30	27
Burngreave street junction	-	-	33	33	24	20
73 Burngreave Road	-	-	43	53	40	33
Park Community Action						
Dovecourt Road	-	-	-	-	29	
Blackwell Close	-	-	-	-	27	
Ingram Court	-	-	-	-	26	
Bard Street	-	-	-	-	39	

Table 1 - ctd

Site	Annual Mean NO ₂ µg/m ³ 2004	Annual Mean NO ₂ µg/m ³ 2005	Annual Mean NO ₂ µg/m ³ 2006	Annual Mean NO ₂ µg/m ³ 2007	Annual Mean NO ₂ µg/m ³ 2008	Annual Mean NO ₂ µg/m ³ 2009
Breath Easy Group						
Manor Oaks Close	-	-	-	-	-	20
Ridgeway Rd, Manor Top	-	-	-	-	-	22
Harborough Ave, Manor Park	-	-	-	-	-	24
Houstead Rd, Darnall	-	-	-	-	-	23
Argyle Cl, Meersbrook	-	-	-	-	-	15
Brinsworth Comprehensive						
Car park	-	-	-	-	-	27
Staff garden	-	-	-	-	-	31
Bungalow	-	-	-	-	-	29
Brunswick School						
Science Garden	-	-	-	-	-	21
Millenium Garden	-	-	-	-	-	24
Top of Car Park	-	-	-	-	-	24
Top Yard	-	-	-	-	-	23
Bottom yard	-	-	-	-	-	22
Crookes						
Wesleyan Chapel	-	-	-	-	-	21
Arran Road	-	-	-	-	-	16
Cross Lane	-	-	-	-	-	16
Deepcar						
Lidl	-	-	-	-	-	27
PO	-	-	-	-	-	28
Carr Road	-	-	-	-	-	35

Table 1 - ctd

Site	Annual Mean NO ₂ µg/m ³ 2004	Annual Mean NO ₂ µg/m ³ 2005	Annual Mean NO ₂ µg/m ³ 2006	Annual Mean NO ₂ µg/m ³ 2007	Annual Mean NO ₂ µg/m ³ 2008	Annual Mean NO ₂ µg/m ³ 2009
Miscellaneous						
Hinde Hs La	-	-	-	-	-	22
Derbyshire La	-	-	-	-	-	21
Winchester Ave a	-	-	-	-	-	19
Winchester Ave b	-	-	-	-	-	21
Netheredge						
25/27 Junction Road	-	-	23	31	27	24
13 Osbourne Road	-	-	22	32	28	28
35 Montgomery Road	-	-	22	29	25	23
Zeds Nether Edge Road	-	-	20	26	23	23
Clifford School Psalter Lane	-	-	18	27	23	23
Penistone Road						
SCT Bedford St/Penistone Rd	-	-	-	-	-	33
Regent Court Floor 7, Hillsborough	-	-	-	-	-	20
Catchbar Lane Traffic Light	-	-	-	-	-	47
Broughton Rd/Penistone Rd	-	-	-	-	-	34
Walkley La Newsagent Front	-	-	-	-	-	24
Walkley La Newsagent Rear	-	-	-	-	-	26
Regent Court Driveway	-	-	-	-	-	22
Co-located						
Tinsley GH2-1	-	-	-	46	41	41
Tinsley GH2-2	-	-	-	46	40	42
Tinsley GH2-3	-	-	-	46	41	42
Sheffield Centre AURN-1	-	-	-	39	35	33
Sheffield Centre AURN-2	-	-	-	36	36	36
Sheffield Centre AURN-3	-	-	-	40	35	34

Table 2 – City Wide Tubes – bias adjusted

Site	Annual Mean NO2 µg/m3 2003	Annual Mean NO2 µg/m3 2004	Annual Mean NO2 µg/m3 2005	Annual Mean NO2 µg/m3 2006	Annual Mean NO2 µg/m3 2007	Annual Mean NO2 µg/m3 2008	Annual Mean NO2 µg/m3 2009
Warren lane	37	31	34	35	34	30	34
7 Bawtry Gate		49	55	57	50	44	48
47 Bawtry Road		54	60	62	59	52	55
109 Bawtry Road		46	51	53	47	43	48
Ecclesfield Road - Low Wincobank	46	52	58	60	52	47	51
Attercliffe Road	46	51	57	59	53	48	51
Attercliffe Road duplicate	56	49	55	57	50	46	50
Barnsley Road - Fir Vale	55	49	55	57	49	47	58
Upwell Street	47	45	50	52	48	40	45
Burngreave Road - Minna Road	49	41	46	48	42	36	38
Loxley New Road	52	45	50	52	47	40	45
Loxley Nnew Road - duplicate	47	44	49	51	48	41	43
Bowden Wood Close	42	48	53	56	42	36	43
Parkway Broad Lane	44	46	51	53	52	43	41
Parkway Broad Lane duplicate	52	45	49	51	52	42	48
Exchange Street	45	41	45	47	48	41	42
Duke Street	48	49	55	57	56	48	47
Waingate	61	49	54	56	55	51	62
Fitzalan Square	60	56	62	64	62	54	59
Barkers Pool	36	31	35	36	35	29	33
Scotland Street	32	28	31	32	30	23	27
Eldon St / Fielding Road Hillsborough	34	28	31	32	27	24	46
Broomspring Close	32	27	30	31	27	23	26
University Roundabout	45	51	56	58	52	48	53
Netherthorpe School	42	34	38	40	39	36	46
Upper Hanover Street	46	44	48	50	45	39	45
Shoreham Street	57	47	52	54	52	46	50
St Mary's Road	41	36	40	41	39	29	36
Chesterfield Road - Woodseats	49	45	49	51	45	38	44
Queens Road/Edmund Road	48	42	47	49	41	35	44
Abbeydale Road - Carter Knowle	47	44	48	50	43	40	42
Ecclesall Road	54	49	54	57	41	37	50
AUN	41	34	38	39	34	31	34
AUN	40	33	37	38	34	31	34
AUN	44	31	34	36	34	31	32
ACE	30	31	34	36	33	29	32
ACE	36	32	36	37	33	29	32
Hillsborough Corner	46	41	46	47	38	33	39
82 Bawtry Road		51	57	59	52	47	52
98 Bawtry Road		51	57	59	51	48	55

Table 3 LTP Tubes – bias adjusted						
Site	Annual Mean NO2 µg/m3 2004	Annual Mean NO2 µg/m3 2005	Annual Mean NO2 µg/m3 2006	Annual Mean NO2 µg/m3 2007	Annual Mean NO2 µg/m3 2008	Annual Mean NO2 µg/m3 2009
Redmires Road - Crimicar Lane	20	20	21	21	19	19
Coldwell Lane/Sandygate Road	26	27	26	25	25	26
Manchester Road/Sandygate Road	29	29	31	27	27	27
Manchester Road/Sale Road	48	46	47	47	45	44
Witham Road/Crookes	57	54	57	61	58	56
Witham Road/Moor Oaks	48	50	52	52	52	54
Western Bank/Northumberland Road	42	45	46	44	44	42
Western Bank/Clarkson Road	53	50	45	51	49	51
Brook Hill/Favell Road	46	52	51	45	41	40
Upper Hanover Street/Hounsfield Road	34	34	37	35	33	33
Crimicar Road/Hallamshire Road	20	19	19	21	18	18
Crimicar Road/Brookhouse Hill	23	24	25	25	26	27
Fulwood Road/Tom Lane	27	28	24	26	24	24
Fulwood Road/Gladstone Road	32	30	32	29	28	31
Fulwood Road/Ashdell Road	32	33	32	33	30	31
Glossop Road/Peel Road	37	34	35	35	33	30
Glossop Road/Westbourne Road	38	37	39	37	36	37
Glossop Road/Clarkehouse Road	41	39	41	40	39	37
West Street/Regent Street	45	47	43	48	42	44
West Street/Leopold Street.	52	48	49	55	46	47
Queens road Mecca			52	59	52	50
Queens road Netto			45	48	41	41
463 Queens road			61	64	53	57
London road -Sark Road			56	57	49	52
London road -Ponsfords			59	62	53	57
Chesterfield road - Meersbrook park			56	60	54	53
513 Chesterfield road			34	39	38	35
Chesterfield road - Olivet road			51	53	46	45
Chesterfield road -Charles Ashmore			37	38	33	33
Meadowhead road			30	31	30	30
Lowfield School GH3				40	35	34
Lowfield School GH3 duplicate				39	33	34
Lowfield School GH3 duplicate				38	33	37