



**CHESTERFIELD**  
BOROUGH COUNCIL

# 2015 Updating and Screening Assessment for Chesterfield Borough Council

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

May, 2015

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## Executive Summary

Chesterfield BC carried out monitoring for Nitrogen Dioxide, Particulates (PM<sub>10</sub> and PM<sub>2.5</sub>), and Benzene under the auspices of the air quality management regime.

The results indicate an ongoing marginal breach of the Air Quality Objective for Nitrogen Dioxide at the row of terraced housing on Church Street, Brimington. The ongoing monitoring by the use of diffusion tubes has been augmented by the use of an automatic NO<sub>x</sub> monitor throughout 2014, located directly opposite the houses in the grounds of a church hall. The process of declaring an AQMA for this location, which began following the last report, is continuing.

The monitoring indicates that the former breach of the Air Quality Objective for Nitrogen Dioxide at part of a row of terraced housing on Sheffield Road, Whittington Moor, is resolved. The use of an automatic NO<sub>x</sub> monitor at this location will take place in 2015, and it is hoped that there will be sufficient data for this to be included in the following report, to be submitted in 2016.

Monitoring indicates that there is no breach of the Air Quality Objective for PM<sub>10</sub> and the trend demonstrates a reduction in levels at both AURN sites. Current monitoring will continue.

Monitoring indicates that there is no breach of the Air Quality Objective for Benzene, the trend shows a very gradual increase in levels, but shows no realistic likelihood of breaching the Objective. Current monitoring will continue.

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# **1 Introduction**

## **1.1 Description of Local Authority Area**

Chesterfield is a market town situated in North Derbyshire. The population is approximately 100,000. The borough is surrounded by the boroughs of North East Derbyshire to the north, south and west, and Bolsover District to the east. The Borough of Chesterfield consists mainly of the town centre, which has a mix of small retail and service sector activities, and immediate suburbs of Chesterfield, to the south, west, and north-west of the town centre. To the east is the small town of Staveley, with ribbon and estate housing developments connecting the two centres. Chesterfield town is surrounded by rural areas, those to the north, west, and south are outside the borough area. Part of the area between Chesterfield town and Staveley is rural farmland, but there are vacant former industrial sites in this area, a legacy of the closure of much of the heavy industry which had driven the growth of the borough. Smaller self-contained former mining villages are located in the east of the borough area. The M1 Motorway skirts the eastern fringes of the borough, and the town centre is bypassed by the A61 trunk road, built on the line of one of the former railways which converged on the town. The main source of pollution in the borough comes from road transport, but there is also some remaining traditional heavy industry still located in the borough, predominantly following the railway line north of the town centre, and in an industrial estate in the north western corner of the borough.





## **1.2 Purpose of Report**

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

The objective of this Updating and Screening Assessment is to identify any matters that have changed which may lead to risk of an air quality objective being exceeded. A checklist approach and screening tools are used to identify significant new sources or changes and whether there is a need for a Detailed Assessment. The USA report should provide an update of any outstanding information requested previously in Review and Assessment reports.

### 1.3 Air Quality Objectives

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

**Table 1.1 Air Quality Objectives included in Regulations for the purpose of LAQM in England**

Pollutant	Air Quality Objective		Date to be achieved by
	Concentration	Measured as	
Benzene	16.25 $\mu\text{g}/\text{m}^3$	Running annual mean	31.12.2003
	5.00 $\mu\text{g}/\text{m}^3$	Running annual mean	31.12.2010
1,3-Butadiene	2.25 $\mu\text{g}/\text{m}^3$	Running annual mean	31.12.2003
Carbon monoxide	10.0 $\text{mg}/\text{m}^3$	Running 8-hour mean	31.12.2003
Lead	0.5 $\mu\text{g}/\text{m}^3$	Annual mean	31.12.2004
	0.25 $\mu\text{g}/\text{m}^3$	Annual mean	31.12.2008
Nitrogen dioxide	200 $\mu\text{g}/\text{m}^3$ not to be exceeded more than 18 times a year	1-hour mean	31.12.2005
	40 $\mu\text{g}/\text{m}^3$	Annual mean	31.12.2005
Particles (PM <sub>10</sub> ) (gravimetric)	50 $\mu\text{g}/\text{m}^3$ , not to be exceeded more than 35 times a year	24-hour mean	31.12.2004
	40 $\mu\text{g}/\text{m}^3$	Annual mean	31.12.2004
Sulphur dioxide	350 $\mu\text{g}/\text{m}^3$ , not to be exceeded more than 24 times a year	1-hour mean	31.12.2004
	125 $\mu\text{g}/\text{m}^3$ , not to be exceeded more than 3 times a year	24-hour mean	31.12.2004
	266 $\mu\text{g}/\text{m}^3$ , not to be exceeded more than 35 times a year	15-minute mean	31.12.2005

## 1.4 Summary of Previous Review and Assessments

Date	Report Title	Conclusions and recommendations
2003	Update & Screening Assessment	Nitrogen Dioxide and PM <sub>10</sub> were at risk of exceeding the health-based objectives. This led to a Detailed Assessment of these pollutants being conducted in 2004
2004	Detailed Assessment	No immediate action necessary, but Nitrogen Dioxide and PM <sub>10</sub> should remain under close review. Improvements in air quality monitoring across the borough was also recommended
2005	Progress Report	Monitoring data highlighted a risk of exceedence of the Air Quality Nitrogen Dioxide Objectives on Derby Road. However, the data capture was not of sufficient accuracy for immediate action to be taken. Recommendations were made to improve the air quality monitoring strategy.
2006	Update & Screening Assessment	Monitoring data highlighted three locations showing exceedence of the annual Nitrogen Dioxide Air Quality Objective. These were Chatsworth Road (A619) and Derby Road (A61 South) and Chesterfield Road, Staveley (A619). Recommendation was made to complete a Detailed Assessment for these areas
2007	Detailed Assessment	Modelled data confirmed that Chatsworth Road (A619) and Derby Road (A61 South) and Chesterfield Road, Staveley (A619). showed exceedence of the annual Nitrogen Dioxide Air Quality Objective. Proposal was made to declare a ribbon AQMA, the proposed boundary of which would be based on a contour produced by the ADMS model, and incorporated areas of the borough predicted as having average annual NO <sub>2</sub> levels in excess of 36 µg/m <sup>3</sup> .
2008	Progress Report	Recommendation to improve data capture, relocation of background monitoring site and relocation of some diffusion tubes to increase accuracy of results. Better working with planning department on major developments and improving the Authority's air quality web pages.
2009	Update & Screening Assessment	Monitoring data highlighted two further areas (both lying outside of the boundary for the proposed AQMA) showing elevated levels of Nitrogen Dioxide and possible exceedence of the annual Nitrogen Dioxide Air Quality Objective. These areas were Whittington Hill and Compton Street. Recommendation to produce detailed assessments for both areas.

<b>Date</b>	<b>Report Title</b>	<b>Conclusions and recommendations</b>
2010	Detailed Assessment and Source apportionment	Detailed assessment based on dispersion modelling of the most heavily trafficked areas within the Borough including Whittington Hill and Compton Street. Both monitoring and modelling indicated no exceedences of any of the objectives in 2009. Elevated levels were however found at a few locations and recommendations were made to continue to monitor trends throughout the Borough and especially at these locations.
2011	Progress Report (revised)	Monitoring data highlighted four areas showing elevated levels of Nitrogen Dioxide and possible exceedence of the annual Nitrogen Dioxide Air Quality Objective. These areas were Whittington Hill; Sheffield Road; Duke Street, Staveley; and Church Street, Brimington. Recommendation to produce Detailed Assessments for these areas.
2012	Update & Screening Assessment	Monitoring Data indicates that NO <sub>2</sub> levels have decreased across the borough as a whole, and as a result the four areas highlighted above area revised to a single site. However, the ongoing Detailed Assessments are continuing.
2013	Detailed Assessment	Monitoring data demonstrated that the four areas identified as being at risk of breaching the AQO are all below the objective and as such there is no requirement to declare AQMAs. However, DEFRA rejected this finding and request that, if the data in the following report indicates an exceedance at the façade of a row of houses within one of the areas (for the 2012 full calendar year), an AQMA be declared in that area.
2013	Progress Report	Monitoring data confirmed the breach of the NO <sub>2</sub> AQO at a single row of terraced houses at the roadside in Brimington.
2014	Progress Report	The monitoring indicates an ongoing marginal breach of the Air Quality Objective for Nitrogen Dioxide at the row of terraced housing on Church Street, Brimington.

## 2 New Monitoring Data

### 2.1 Summary of Monitoring Undertaken

#### 2.1.1 Automatic Monitoring Sites

The details of the sites and the monitoring being undertaken at each location are given below in Tables 2.1a and 2.1.b:

**Table 2.1a: Details of Automatic Monitoring Sites**

Site Name	Site Type	OS Grid Ref		Pollutants Monitored	Monitoring Technique
Chatsworth Road	Urban Traffic	436349 E	370657 N	NO <sub>x</sub>	Chemi-luminescent
				PM <sub>10</sub>	FDMS
				PM <sub>2.5</sub>	FDMS
				Benzene	Pumped Tubes
				Aldehyde	Pumped Filters

**Table 2.1b: Details of Automatic Monitoring Sites**

Site Name	In AQMA?	Relevant Exposure? (Y/N with distance (m) to relevant exposure)	Distance to kerb of nearest road (N/A if not applicable)	Does this location represent worst-case exposure?
Chatsworth Road	N	Y (1m)	4.5m	Yes

The maps, overleaf, show the locations of the two automatic monitoring stations operated by Chesterfield Borough Council, both of which are affiliated to the Automatic Urban/Rural Network (AURN) providing monitoring data to central government under the management and oversight of BureauVeritas.

**Figure 2.1 Location of Chatsworth Road Automatic Monitoring Site**



Note: For data handling and data download purposes, this site is referred to as Chesterfield Roadside, by both BureauVeritas and DEFRA

This site, formerly classified as a Roadside site, has been reclassified as an Urban Traffic site. This site is indicative of public exposure for dwellings in urban locations.

**Figure 2.2: New AURN Monitoring Location**



The AURN monitoring unit, formerly located at Queens Park has been moved, as a

result of the redevelopment of the sports field

Note: For data handling and data download purposes, this site is referred to as Chesterfield Loundsley Green, by both BureauVeritas and DEFRA.

This site is classified as an Urban Background site, and is indicative of the diffusion tubes in locations set away from main roads. The immediate surroundings are playing fields, with residential development further afield. The adjacent road is used for access within the residential area, and does not carry through traffic. Relocating and recommissioning this unit proved problematic, and as a result no data is available for this report. However, this site is now in use and will provide data for subsequent reports.

In addition to the above sites which are affiliated to AURN, we have installed a temporary site, this site started operation in mid December 2013 and operated throughout 2014, allowing a full 12 months of data to be gathered.

**Table 2.2: Details of Temporary Automatic Monitoring Site**

Site Name	Site Type	OS Grid Ref		Pollutants Monitored	Monitoring Technique
Brimington Church Street	Urban Traffic	440428 E	373503 N	NOx	Chemi-luminescent

Site Name	In AQMA?	Relevant Exposure? (Y/N with distance (m) to relevant exposure)	Distance to kerb of nearest road (N/A if not applicable)	Does this location represent worst-case exposure?
Brimington Church Street	N	Y (1m)	2m	Yes

This site is operated, on contract, by TRL Ltd, who are responsible for running the site and validating the data retrieved, which is then made available to this Authority.

**Figure 2.3: Location of Temporary Automatic Monitoring Site**



**Figure 2.4: Location of Sampling Head in Relation of the Affected Row of Terraced Housing on the Opposite Side of Church St**



The sample head (arrowed) is placed between the road sign and the window of the building façade, and projects above the adjacent wall. One of the diffusion tubes on the terrace façade is directly opposite, but is obscured by the van near the centre of the picture. Note how, due to the row of parked vehicles, the useable carriageway is displaced away from the terrace façade. The practical result of this is that the sample head is located an equivalent distance from the traffic as the diffusion tubes on the housing façade.



The co-location tubes which had been used on the Chesterfield Site (at Queens Park Annex, and due to be relocated due to impending redevelopment) are currently being used at this site.

Details of the QA/QC procedures and calibrations are given in Appendix A

### 2.1.2 Non-Automatic Monitoring Sites

The locations of the NO<sub>2</sub> diffusion tubes across the Borough as a whole has remained unchanged since the previous report. As mentioned the increased monitoring in Hasland has remained, reflecting the change in a road junction, and the concerns regarding increased traffic congestion. Public disquiet regarding this led to the previous mini roundabout being reinstated and the traffic lights being removed. The following figures show the changes in the affected road junction and the location of the diffusion tubes placed to assess the possible adverse impact of the changes

**Figure 2.5: Original Road Layout (now reinstated)**



(Courtesy of Google Maps)

This was replaced by a traffic light controlled junction (shown in Figure 2.6, overleaf).

**Figure 2.6: Revised Road Layout (now removed)**



(Courtesy of Google Maps)

The green space at the top of both pictures is Eastwood Park. This has been the subject of investment to bring it back into general use. Concern had been raised that the previously uncontrolled junction may have given rise to an increased risk of accidents to crossing pedestrians, prompting the alterations which were carried out by the County Council (in their role as the local highways authority). The new monitoring locations are spaced along the main road and on the junction road which makes up the leg of the “T” junction, with an additional tube on a further adjacent road junction, due to the proximity of houses at that location, and the locations are shown in Figure 2.7, overleaf. There are no plans, at present, to relocate any diffusion tubes across the borough.

**Figure 2.7: Diffusion Tube Locations in Hasland**



In addition to this the operation of the temporary automatic monitor, analysing NO<sub>2</sub> in support of the monitoring which highlighted a marginal breach of the AQO, was also being supported by the use of co-location tubes which were moved from the background AURN site.

The locations of diffusion tube monitoring across the Borough during the period covered by this report is shown in Appendix B and in Table 2.3 overleaf. As can be seen from the map in Appendix B, the monitoring locations now reflect the major roads and possible congestion points on those roads.

**Table 2.3: Details of Diffusion Tube Monitoring Sites**

Tube Number	Site Name	Site Type	O/S Grid Reference	In AQMA?	Relevant Exposure?	Distance to Kerb of Nearest Road	Worst Case Location?
1	Bradbury Club, 150 Chatsworth Rd	Façade	437222 370956	No	Yes	1m	Yes
2	Bridge Inn, Hollis Lane	Façade	438710 370950	No	Yes	2m	Yes
3	376 Sheffield Road	Façade	438291 373006	No	Yes	1m	Yes
4	390 Sheffield Road	Façade	438284 373057	No	Yes	1m	Yes
5	17, South Place	Façade	438293 370863	No	Yes	1m	Yes
6	6 Church Street, Brimington	Façade	440440 373514	No	Yes	1m	Yes
7	DCC Offices, West Street	Roadside	437670 371490	No	Yes	1m	Yes
8	St Augustines, 212 Derby Road	Façade	438395 369776	No	Yes	3m	Yes
9	Lincoln Street, 287 Derby Road	Façade	438385 369574	No	Yes	2m	Yes
10	7 High Street, Brimington	Façade	440531 373484	No	Yes	1m	Yes
11	42, Whittington Hill (B6052)	Façade	438307 374560	No	Yes	2m	Yes
12	460, Sheffield Road	Façade	438279 373336	No	Yes	2m	Yes
13	10 Calow Lane, Hasland	Façade	439780 369440	No	Yes	1m	Yes
14	348 Derby Road, Storrforth Lane	Façade	438357 369410	No	Yes	2m	Yes
15	Chatsworth Road AQ. Site	Co-location	436349 370658	No	Yes	4m	Yes
16	Chatsworth Road AQ. Site	Co-location	436349 370658	No	Yes	4m	Yes
17	Chatsworth Road AQ. Site	Co-location	436349 370658	No	Yes	4m	Yes
18	Church St AQ Site	Co-location	440429 373503	No	Yes	2m	Yes
19	Church St AQ Site	Co-location	440429 373503	No	Yes	2m	Yes
20	Church St AQ Site	Co-location	440429 373503	No	Yes	2m	Yes
21	14 Chesterfield Road, Brimington	Roadside	440175 373396	No	Yes	1m	Yes
22	25/27 Ringwood Road, Brimington	Façade	440669 373711	No	Yes	1m	Yes
23	29 Mansfield Road, Hasland	Façade	439830 369320	No	Yes	2m	Yes
24	10, Compton Street, Saltergate	Façade	437686 371433	No	Yes	1m	Yes

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Tube Number	Site Name	Site Type	O/S Grid Reference	In AQMA?	Relevant Exposure?	Distance to Kerb of Nearest Road	Worst Case Location?
25	J+S Trophies, The Green, Hasland	Façade	439490 369608	No	Yes	3m	Yes
26	Harold Lillekar's Funerals, Mansfield Rd	Façade	439490 369590	No	Yes	6m	Yes
27	Lowgates, Staveley	Façade	443897 374912	No	Yes	3m	Yes
28	Patrick Hinds House, Church St, Brimington	Façade	440323 373482	No	Yes	1m	Yes
29	Hollywell Cross R/T, Old Post Restaurant	Façade	438417 371357	No	Yes	1m	Yes
30	348, Chatsworth Rd, Brampton Mile	Façade	436702 370761	No	Yes	1m	Yes
31	386 Sheffield Road	Façade	438289 373028	No	Yes	2m	Yes
32	Warner Street, Hasland	Roadside	438976 370356	No	Yes	1m	Yes
33	55 Duke Street, Staveley	Façade	443452 374762	No	Yes	4m	Yes
34	Travel Blank	-	-	-	-	-	-
35	632, Chatsworth Road, Storrs Road	Façade	435654 370537	No	Yes	3m	Yes
36	Lite Bites, Mansfield Road, Hasland	Façade	439710 369420	No	Yes	2m	Yes
37	50 Church Street, Brimington	Façade	440361 373513	No	Yes	1m	Yes
38	14 Church Street, Brimington	Façade	440421 373515	No	Yes	1m	Yes
39	43 Sheffield Road	Façade	438343 371908	No	Yes	1m	Yes
40	380 Sheffield Road	Façade	438290 373014	No	Yes	1m	Yes
41	James Street / Lockford Lane	Roadside	438407 372798	No	Yes	1m	Yes

The locations of the diffusion tubes across the borough is shown in Appendix B

### **2.1.3 Benzene**

Benzene is sampled at the Chesterfield Roadside site, by the use of sampling tubes containing a proprietary absorbent (Carbopack X). The tubes are exposed for 14 days, before being returned to RicardoAEA for analysis.

## 2.2 Comparison of Monitoring Results with Air Quality Objectives

### 2.2.1 Nitrogen Dioxide

#### Automatic Monitoring Data

Nitrogen Dioxide is monitored by the use of a single AURN affiliated site (pending successful relocation and recommissioning of a second site), allowing the co-location of diffusion tubes to validate monthly exposed diffusion tubes which are located at appropriate sites around the borough.

**Table 2.4a: Results of Automatic Monitoring for Nitrogen Dioxide: Comparison with Annual Mean Objective**

Site ID	Site Type	Within AQMA?	Data Capture 2014 %	Annual mean concentrations ( $\mu\text{g}/\text{m}^3$ )			
				2011	2012	2013	2014
Chesterfield Roadside	Traffic	N	90.6	23.2	18.2	21.7	20.6

**Table 2.4b: Results of Automatic Monitoring for Nitrogen Dioxide: Comparison with 1-hour Mean Objective**

Site ID	Site Type	Within AQMA?	Data Capture 2014 %	Number of Exceedences of hourly mean ( $200 \mu\text{g}/\text{m}^3$ )			
				Where the period of valid data is less than 90% of a full year, include the 99.8 <sup>th</sup> percentile of hourly means in brackets.			
				2011	2012	2013	2014
Chesterfield Roadside	Traffic	N	90.6	0 (94)	0	0	0

Additional monitoring has also taken place at the aforementioned temporary site at Church Street, Brimington. The monitoring data from this location is summarised below:

**Table 2.5a: Results of Automatic Monitoring for Nitrogen Dioxide: Comparison with Annual Mean Objective**

Site ID	Site Type	Within AQMA?	Data Capture 2014 %	Annual mean concentration ( $\mu\text{g}/\text{m}^3$ )
Church Street	Traffic	N	97.6	43.8

**Table 2.5b: Results of Automatic Monitoring for Nitrogen Dioxide: Comparison with 1-hour Mean Objective**

Site ID	Site Type	Within AQMA?	Data Capture 2014 %	Number of Exceedences of hourly mean ( $200 \mu\text{g}/\text{m}^3$ ) Where the period of valid data is less than 90% of a full year, include the 99.8 <sup>th</sup> percentile of hourly means in brackets.
Church Street	Traffic	N	97.6	0

The monitoring indicates a breach of the AQO and this compares favourably with the diffusion tube monitoring., the results of which follow in the next section



## Diffusion Tube Monitoring Data

Table 2.6 Results of Nitrogen Dioxide Diffusion Tubes in 2014

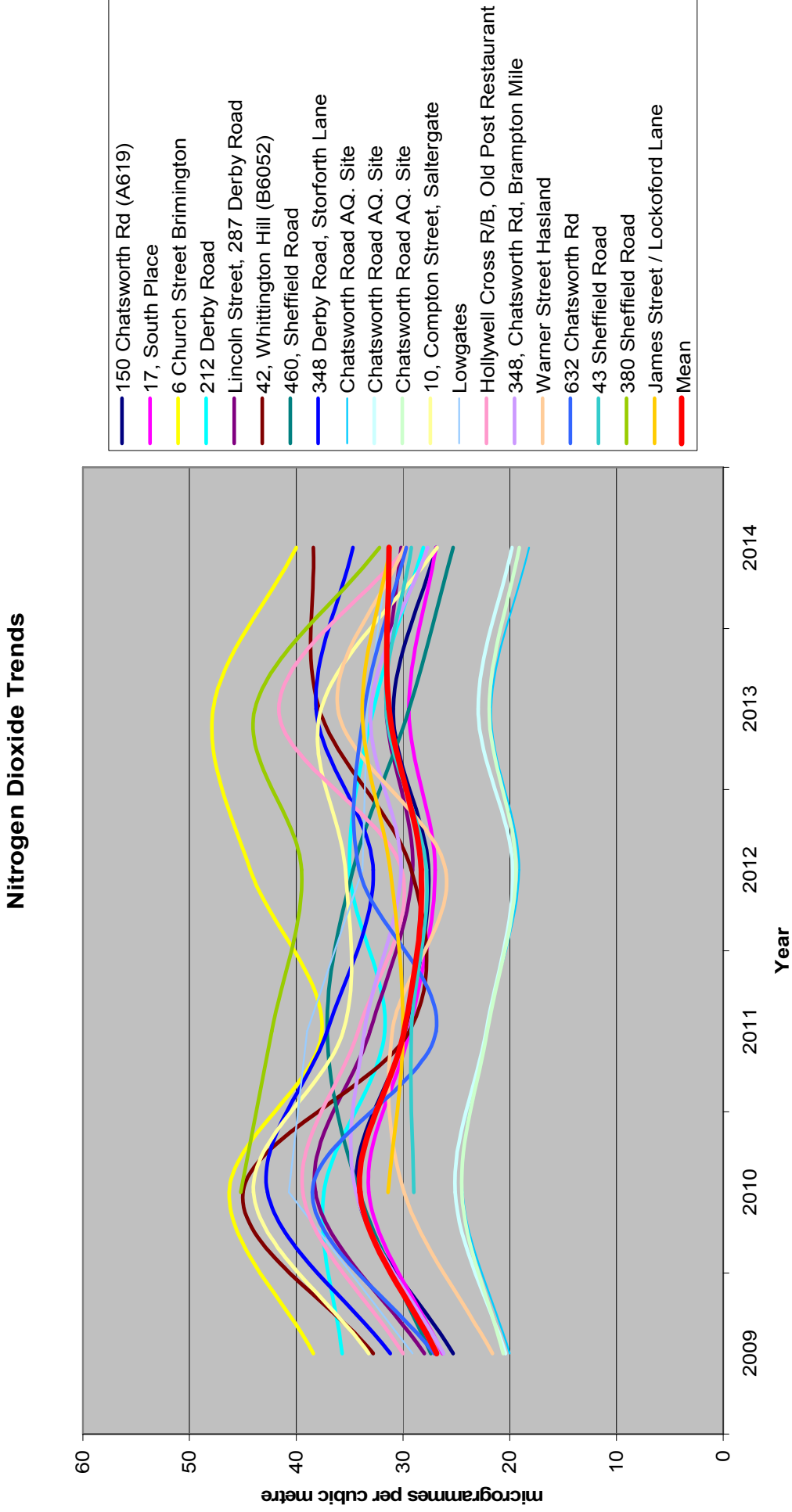
Tube No	Site		Data Capture %	Bias Adjusted Mean
1	150 Chatsworth Rd (A619)	Façade	100	26.9
2	Bridge Inn, Hollis Lane	Façade	100	34.0
3	376 Sheffield Road	Façade	75	35.4
4	390 Sheffield Road	Façade	92	36.5
5	17, South Place	Façade	100	26.9
6	6 Church Street Brimington	Façade	92	<b>43.8</b>
7	DCC Offices, West Street	Façade	92	24.1
8	212 Derby Road	Façade	92	30.7
9	Lincoln Street, 287 Derby Road	Façade	75	30.2
10	7 High Street Brimington	Façade	100	38.0
11	42, Whittington Hill (B6052)	Façade	100	35.2
12	460, Sheffield Road	Façade	92	27.6
13	10 Calow Lane, Hasland	Façade	100	24.6
14	348 Derby Road, Storforth Lane	Façade	100	34.7
15	Chatsworth Road AQ. Site	Co-location	84	18.2
16	Chatsworth Road AQ. Site	Co-location	84	19.8
17	Chatsworth Road AQ. Site	Co-location	84	19.1
18	Church St, Brimington	Co-location	100	32.6
19	Church St, Brimington	Co-location	100	32.6
20	Church St, Brimington	Co-location	100	31.1
21	14 Chesterfield Road, Brimington	Façade	92	32.1
22	25/27 Ringwood Road	Façade	92	32.3
23	Brimington	Façade	84	25.2
24	29 Mansfield Road	Façade	75	35.8
25	10, Compton Street, Saltergate	Façade	92	33.0
26	J&S Trophies, The Green	Façade	92	18.3
27	Harold Lillikers Funerals, Hasland	Façade	100	31.3
28	Lowgates	Façade	92	31.9
29	Fingertips, Church Street, Brimington	Façade	84	35.6
30	Hollywell Cross R/B, Old Post Restaurant	Façade	92	30.2
31	348, Chatsworth Rd, Brampton Mile	Façade	84	38.4
32	386 Sheffield Road	Façade	100	29.9
33	Warner Street Hasland	Façade	75	32.8
35	55 Duke Street Staveley	Façade	100	29.7
36	632, Chatsworth Road, Storrs Road	Façade	100	27.1
37	Lite Bites, Mansfield Road	Façade	92	36.1
38	50 Church Street Brimington	Façade	75	<b>42.2</b>
39	14 Church Street Brimington	Façade	100	29.2
40	43 Sheffield Road	Façade	100	32.2
41	380 Sheffield Road	Façade	84	31.2
	James Street / Lockoford Lane	Façade		

The AQO for nitrogen dioxide is breached at two sites, 6 and 14 Church Street, Brimington. These results are confirmed by the automatic monitor, located close nearby (as previously detailed). This is discussed further later in this section of the report.

Figure 2.8, below, shows the trends in nitrogen dioxide concentrations between 2009 and 2014 (only showing the diffusion tubes which were continuously exposed throughout this period). The general underlying trend is a gradual fall in the levels, with a fluctuation in general levels which appear to be affected by regional influences (as they appear to have a similar effect on all tube locations) – a linear regression assessment of each of the lines of data shows either a reduction (in most data series) or a steady trend (this analysis has not been included in the figure, as it obscured the real world data)



Figure 2.8: Trends in Annual Mean Nitrogen Dioxide Concentrations measured at Diffusion Tube Monitoring Sites



As in previous reports closer analysis of two specific areas has also been carried out.

The area of Church Street, Brimington was subject to intensive monitoring, augmenting the existing multiple diffusion tubes, by the use of an automatic monitor operated on our behalf by TTRL Ltd, throughout 2014 (previously mentioned on page 24) .

The results from the diffusion tubes are shown below:

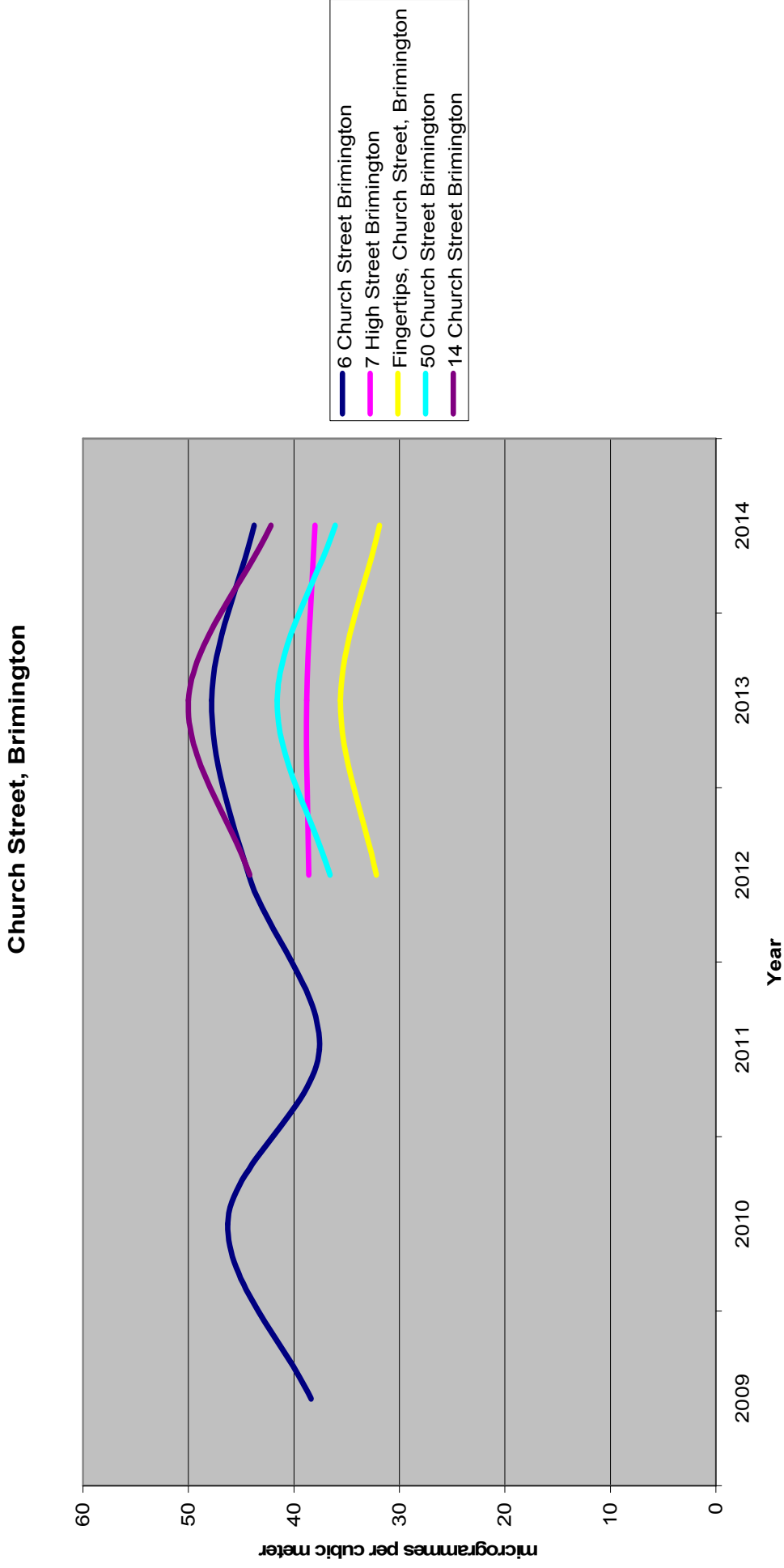
**Table 2.7: Nitrogen Dioxide Results from Church Street, Brimington**

<b>Site</b>	<b>2009</b>	<b>2010</b>	<b>2011</b>	<b>2012</b>	<b>2013</b>	<b>2014</b>	<i>Data Capture Rate %</i>
6 Church Street Brimington	<b>38.4</b>	<b>46.3</b>	<b>37.6</b>	<b>44.3</b>	<b>47.8</b>	<b>43.8</b>	92
7 High Street Brimington				38.6	38.8	38	100
Fingertips, Church Street, Brimington				32.2	35.6	31.9	100
50 Church Street Brimington				36.6	<b>41.6</b>	<b>36.1</b>	100
14 Church Street Brimington				<b>44.2</b>	<b>50</b>	<b>42.2</b>	100

These results are plotted below, clearly showing the trends over time. As can be seen from the full dataset (in Figure 2.8) the most recent data shows a reduction in levels. Most noticeable is the reduction at the monitoring locations on Church Street, which is affected by “stop/start” traffic flows due to a lights controlled junction. The levels on High Street show a very slight reduction in levels and this appears to reflect the fact that the traffic passing this location is free flowing.



Figure 2.9: Nitrogen Dioxide Trends at Church Street



The second site, at Sheffield Road, is on a row of terraced houses which are adjacent to a main road, and a revised junction serving the football ground and adjacent major supermarket. The Detailed Assessment in this area was carried out by the use of 4 diffusion tubes on the façade of the terraced houses and as the levels found were close to, but below, the AQO this monitoring has continued.

The results of the diffusion tubes are shown below:

**Table 2.8: Nitrogen Dioxide Results from Sheffield Road, Whittington Moor**

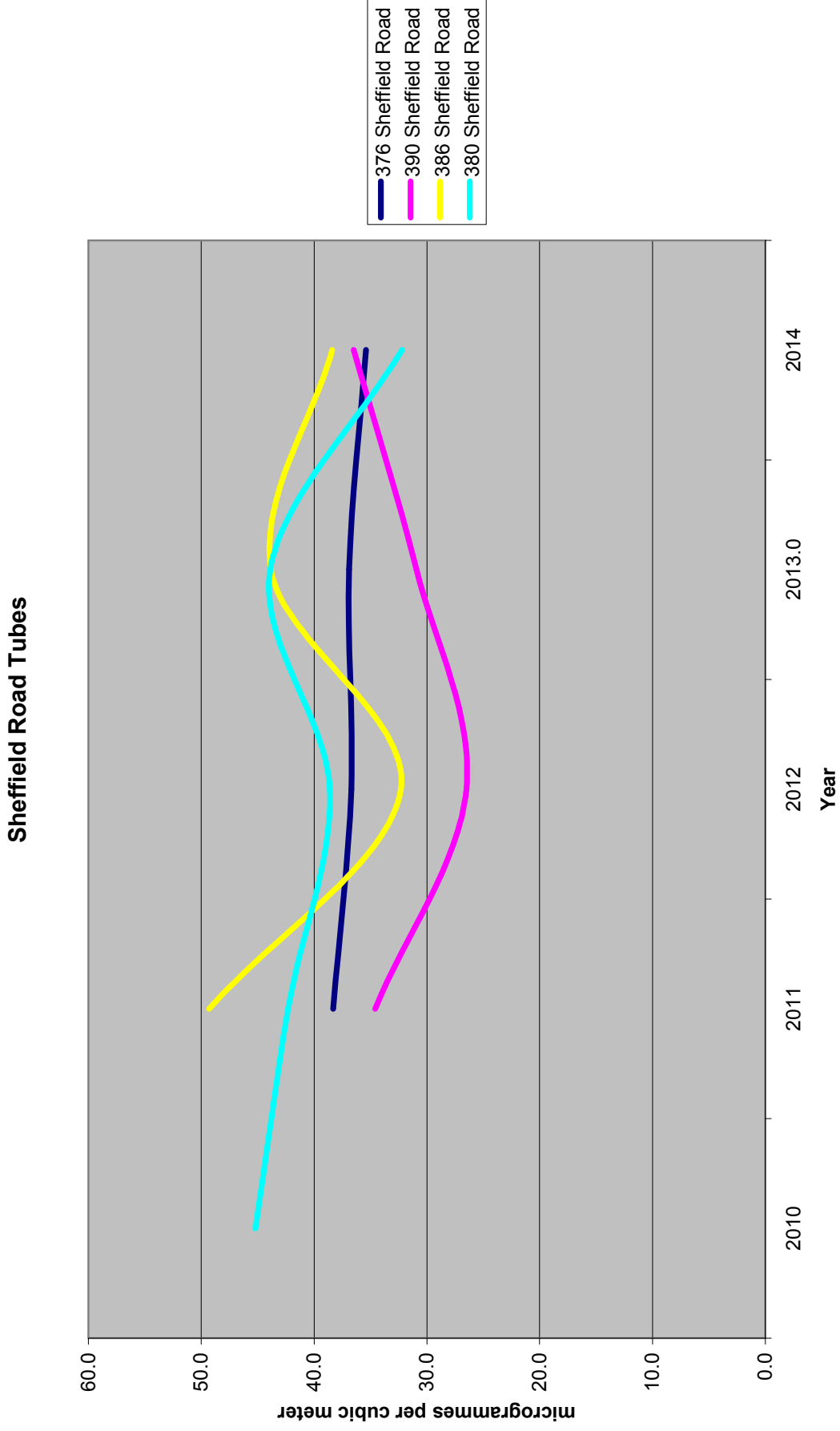
<b>Site</b>	<b>2010</b>	<b>2011</b>	<b>2012</b>	<b>2013</b>	<b>2014</b>	<i>Data Capture Rate %</i>
<b>376 Sheffield Road</b>		38.3	36.7	36.9	35.4	75
<b>390 Sheffield Road</b>		34.6	26.5	30.9	36.5	100
<b>386 Sheffield Road</b>		49.3	32.3	43.8	38.4	84
<b>380 Sheffield Road</b>	45.2	42.3	38.6	43.9	32.2	100

These results are plotted below, showing trends over time





**Figure 2.9: Nitrogen Dioxide Trends at Sheffield Road**



As can clearly be seen, the levels of traffic pollution have dropped below the Air Quality Objective. However, it is troubling to note that a single diffusion tube (390 Sheffield Rd) is showing a steady increase. This also appears to be counter-intuitive, as this site is the farthest away from the traffic light controlled junction and traffic should have finished accelerating away from the junction by this point. We still intend to undertake a more detailed assessment in this area, by relocating the temporary automatic monitor which has been situated at Church Street, Brimington. Work is progressing on this and we expect to be able to report preliminary results in the next annual report.

### 2.2.2 PM<sub>10</sub>

PM<sub>10</sub> (and PM<sub>2.5</sub>) is monitored at both of the AURN sites in the Borough (only the site at Chatsworth Road is reported on, due to the relocation of the unit which had been located at Queen’s Park). Monitoring is by use of a TEOM FDMS system.

The annual mean level of 19 µg/m<sup>3</sup> is half the Air Quality Objective. There are 11 24-hour exceedences of 50 µg/m<sup>3</sup>, and correspondingly the 90<sup>th</sup> percentile of 24-hour concentrations is 33 µg/m<sup>3</sup>. Data capture at the site has markedly improved (when compared with recent years) to 97% throughout 2014.

**Table 2.9a: Results of PM<sub>10</sub> Automatic Monitoring: Comparison with Annual Mean Objective**

Site ID	Site Type	Within AQMA?	Data Capture 2014 %	Annual mean concentrations (µg/m <sup>3</sup> )				
				2010	2011	2012	2013	2014
Chesterfield Roadside	Traffic	N	97	22.9	17.8	20.2	15.9	19.0

**Table 2.9b: Results of PM<sub>10</sub> Automatic Monitoring: Comparison with 24-hour Mean Objective**

Site ID	Location	Within AQMA?	Data Capture 2014 %	Number of Exceedences of daily mean objective (50 µg/m <sup>3</sup> ) Where data capture < 90 <sup>th</sup> , include the 90 <sup>th</sup> percentile of daily means in brackets.				
				2010	2011	2012	2013	2014
Chesterfield Roadside	Traffic	N	97	0	0 (27.6)	14 (35.7)	6 (26)	11

Monitoring indicates that there has been no breach of the Air Quality Objective.

### 2.2.3 Benzene

Benzene is sampled at the Chesterfield Roadside site, by the use of sampling tubes containing a proprietary absorbent (Carbopack X). The tubes are exposed for 14 days. The monitoring results (shown below) are well below the AQO, and have consistently been so over the years of monitoring at this site.

**Table 2.10: Benzene Results**

Date on	Date off		
19/12/2013	02/01/2014	0.51	µg/m <sup>3</sup>
02/01/2014	16/01/2014	0.63	µg/m <sup>3</sup>
16/01/2014	29/01/2014	1.37	µg/m <sup>3</sup>
29/01/2014	12/02/2014	1.23	µg/m <sup>3</sup>
12/02/2014	27/02/2014	0.89	µg/m <sup>3</sup>
27/02/2014	27/03/2014	0.83	µg/m <sup>3</sup>
27/03/2014	10/04/2014	1.32	µg/m <sup>3</sup>
10/04/2014	24/04/2014	0.81	µg/m <sup>3</sup>
24/04/2014	08/05/2014	0.73	µg/m <sup>3</sup>
08/05/2014	21/05/2014	0.52	µg/m <sup>3</sup>
21/05/2014	05/06/2014	0.74	µg/m <sup>3</sup>
05/06/2014	18/06/2014	0.45	µg/m <sup>3</sup>
18/06/2014	03/07/2014	0.52	µg/m <sup>3</sup>
03/07/2014	17/07/2014	0.47	µg/m <sup>3</sup>
17/07/2014	31/07/2014	0.83	µg/m <sup>3</sup>
31/07/2014	14/08/2014	0.52	µg/m <sup>3</sup>
14/08/2014	28/08/2014	0.39	µg/m <sup>3</sup>
28/08/2014	11/09/2014	0.89	µg/m <sup>3</sup>
11/09/2014	09/10/2014	0.72	µg/m <sup>3</sup>
09/10/2014	23/10/2014	0.62	µg/m <sup>3</sup>
23/10/2014	06/11/2014	0.74	µg/m <sup>3</sup>
<b>Mean</b>		<b>0.75</b>	µg/m <sup>3</sup>

### 2.2.4 Summary of Compliance with AQS Objectives

Chesterfield BC has measured concentrations of Nitrogen Dioxide above the annual mean objective at a relevant location, this confirms the preliminary findings in the 2014 report. Given this confirmation the procedure (which was begun following the submission of the previous report in late 2014) to declare an AQMA in the vicinity of the breach, will continue.

### **3 Road Traffic Sources**

#### **3.1 Narrow Congested Streets with Residential Properties Close to the Kerb**

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

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

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

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

Chesterfield BC confirms that there are no new/newly identified roads with high flows of buses/HDVs.

#### **3.4 Junctions**

Chesterfield BC confirms that there are no new/newly identified busy junctions/busy roads.

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

Chesterfield BC confirms that there are no new/proposed roads.

### **3.6 Roads with Significantly Changed Traffic Flows**

Chesterfield BC confirms that there are no new/newly identified roads with significantly changed traffic flows.

### **3.7 Bus and Coach Stations**

Chesterfield BC confirms that there are no relevant bus stations in the Local Authority area.

## **4 Other Transport Sources**

### **4.1 Airports**

Chesterfield BC confirms that there are no airports in the Local Authority area.

### **4.2 Railways (Diesel and Steam Trains)**

#### **4.2.1 Stationary Trains**

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

#### **4.2.2 Moving Trains**

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

### **4.3 Ports (Shipping)**

Chesterfield BC confirms that there are no ports or shipping that meet the specified criteria within the Local Authority area.



## **5 Industrial Sources**

### **5.1 Industrial Installations**

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

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

#### **5.1.2 Existing Installations where Emissions have Increased Substantially or New Relevant Exposure has been Introduced**

Chesterfield BC confirms that there are no industrial installations with substantially increased emissions or new relevant exposure in their vicinity within its area or nearby in a neighbouring authority.

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

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

### **5.2 Major Fuel (Petrol) Storage Depots**

There are no major fuel (petrol) storage depots within the Local Authority area.

### **5.3 Petrol Stations**

Chesterfield BC confirms that there are no petrol stations meeting the specified criteria.

## **5.4 Poultry Farms**

Chesterfield BC confirms that there are no poultry farms meeting the specified criteria.

# **6 Commercial and Domestic Sources**

## **6.1 Biomass Combustion – Individual Installations**

Chesterfield BC confirms that there are no biomass combustion plant in the Local Authority area.

## **6.2 Biomass Combustion – Combined Impacts**

Chesterfield BC confirms that there are no biomass combustion plant in the Local Authority area.

## **6.3 Domestic Solid-Fuel Burning**

Chesterfield BC confirms that there are no areas of significant domestic solid fuel use in the Local Authority area.

# **7 Fugitive or Uncontrolled Sources**

Chesterfield BC confirms that there are no potential sources of fugitive particulate matter emissions in the Local Authority area.

## **8 Conclusions and Proposed Actions**

### **8.1 Conclusions from New Monitoring Data**

New monitoring data shows a reduction in the levels of air pollution across the borough, but there are still “hotspots” where traffic pollution levels are of concern. There are two such areas. One (Church Street, Brimington) is showing an ongoing breach of the Nitrogen Dioxide Objective on part of the section of road under assessment. The other (Sheffield Road, Whittington Moor) is now below the Nitrogen Dioxide Objective level.

### **8.2 Conclusions from Assessment of Sources**

There are no new or substantially changed sources of air pollution. The only significant source of pollution remains traffic.

### **8.3 Proposed Actions**

The process of declaring an Air Quality Management Area (which began following the last report, submitted in August 2014) will continue.

Targeted in-depth monitoring of Nitrogen Dioxide levels, at the southern end of Sheffield Road, Whittington Moor will continue, as planned.

## 9 References

Local Air Quality Management Technical Guidance – LAQM TG(09)

Diffusion Tubes for Ambient NO<sub>2</sub> Monitoring: Practical Guidance for Laboratories and Users, AEA/ENV/R/2504 – AEA, Feb 2008

[http://laqm.defra.gov.uk/documents/Database\\_Diffusion\\_Tube\\_Bias\\_Factors-v03\\_15-Final.xls](http://laqm.defra.gov.uk/documents/Database_Diffusion_Tube_Bias_Factors-v03_15-Final.xls)

[http://laqm.defra.gov.uk/documents/Tube\\_Precision\\_2015\\_version\\_03\\_15-Final.pdf](http://laqm.defra.gov.uk/documents/Tube_Precision_2015_version_03_15-Final.pdf)

NO<sub>2</sub> Diffusion Tubes for LAQM: Guidance Notes for Local Authorities, AEA, 2006  
QA/QC Procedures for the UK Automatic Urban and Rural Air Quality Monitoring Network, AEAT/ENV/R/2837 – AEA, 2009

The Relationship Between Diffusion Bias and Distance from the Road - Air Quality Consultants Ltd, 2006

A Review of Air Quality Station Type Classifications for the UK Compliance Monitoring - Ricardo AEA, 2013

The Car and the Commute - RAC Foundation, 2013

Systematic Biases in Measurement of Urban Nitrogen Dioxide using Passive Diffusion Samplers - Edinburgh Research Archive, 2000

NO<sub>2</sub> Concentrations and Distance from Roads - Air Quality Consultants, 2008

The Contribution of Transport to Air Quality - European Environment Agency, 2012

## **Appendices**

Appendix A: Quality Assurance / Quality Control (QA/QC) Data

Appendix B: Locations of diffusion tube samplers across the Borough

## Appendix A: QA:QC Data

### Diffusion Tube Bias Adjustment Factors

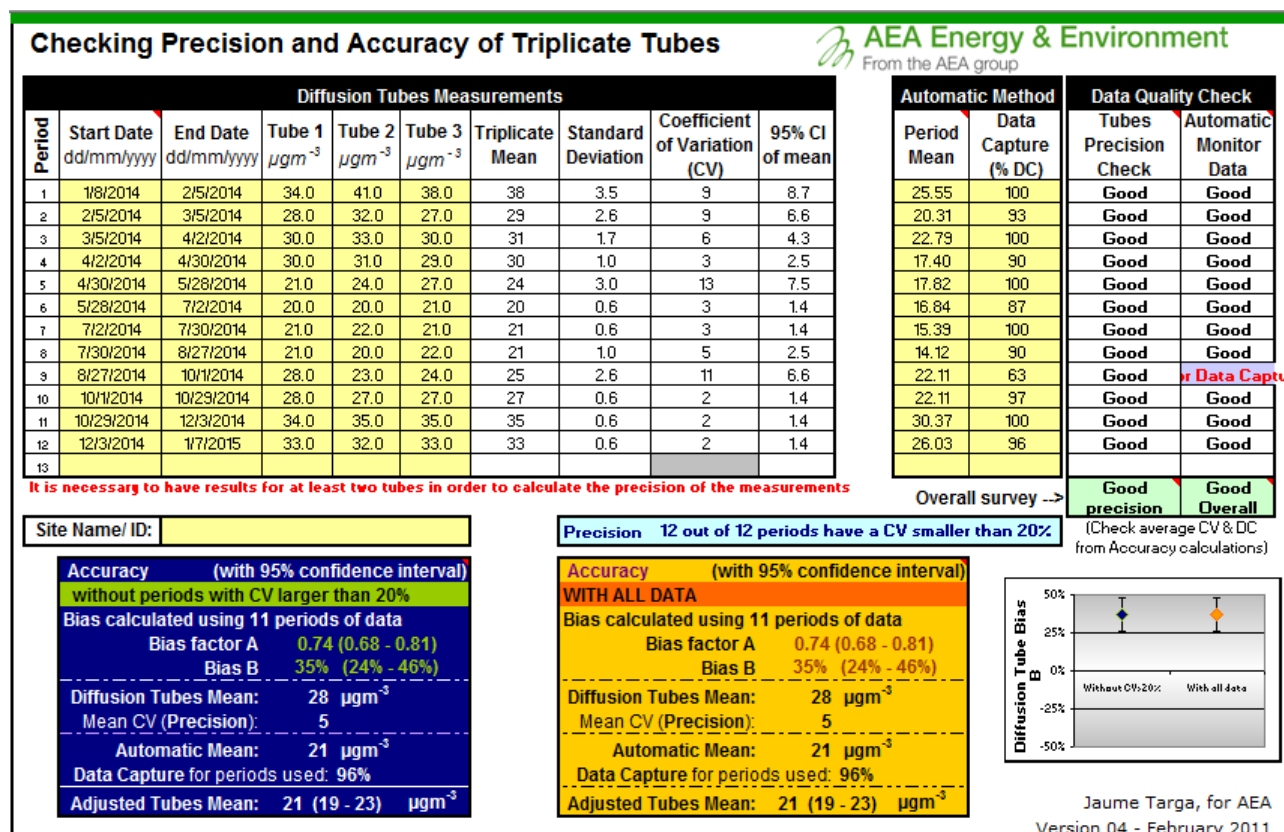
NO<sub>2</sub> diffusion tubes are supplied by South Yorkshire Air Quality Samplers, the preparation method being 50% TEA in acetone. The laboratory follows the procedures set out in the Harmonisation Practical Guidance. The national bias factor for the tubes supplied by this source is 0.67. Data from the two sites operated by Chesterfield BC is supplied to DEFRA for input into the calculation of this factor.

### Factor from Local Co-location Studies (if available)

The local bias factor for the traffic site operated by Chesterfield BC is as follows:

Chesterfield Roadside (Chatsworth Road): 0.74

The calculation for deriving this factor is shown below:



Further details on the sites are given in section 2.1.1 of this report

### Discussion of Choice of Factor to Use

The bias factor used in adjusting the data for this report is a local factor and, more specifically, is calculated using the traffic site, Chesterfield Roadside. This site is used as it is in a very similar location to those where the diffusion tubes are all now placed. The local factor (0.74) varies from the national factor (0.67) but as the data is specific to this region and, more pertinently, to the roadside monitoring which is now

being uniformly undertaken, it is believed that the use of the local factor is fully justified. It will also be noted that the results obtained by the diffusion tubes monitoring at Church Street, Brimington compare favourably with the results obtained by the automatic monitor used in close proximity.

### **PM Monitoring Adjustment**

Monitoring is carried out using FDMS equipment, no data adjustment is required.

### **Short-term to Long-term Data adjustment**

No adjustment of the data is required.

### **QA/QC of automatic monitoring**

Data validation is carried out by BureauVeritas on behalf of DEFRA. On site calibration is carried out by Chesterfield BC staff on a 14 day cycle, using standard calibration gases, and the calibration data is sent direct to BureauVeritas, and RicardoAEA, by email.

The temporary site is operated, on contract by TTRL Ltd. Their in-house team is responsible for the verification and full QA/QC of the data which they have supplied to us.

### **QA/QC of diffusion tube monitoring**

The diffusion tube monitoring is carried out in full compliance with the guidance contained in the document "Diffusion Tubes for Ambient NO<sub>2</sub> Monitoring: Practical Guidance for Laboratories and Users". The WASP results show the overall performance of the analysis laboratory as good.





**Appendix B: Location of Diffusion Tube Monitoring Across the Borough Area**

