2011 Air Quality Progress Report for *Gedling Borough Council*

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

April 2011

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Executive Summary

Part IV of the Environment Act 1995 requires local authorities to review and assess the current and future air quality in their areas against objectives set out for eight key air pollutants, under the provisions of the National Air Quality Regulations 2000 and the Air Quality (Amendment) Regulations 2002.

A review and assessment of air quality is the first step in the Local Air Quality Management (LAQM) process. Part IV of the Act requires each local authority to review air quality 'from time to time'. The National Air Quality Regulations 2000 and the Air Quality (Amendment) Regulations 2002 prescribe air quality objectives and the dates for meeting them. Local Authorities should only undertake a level of assessment that is commensurate with the risk of an air quality objective being exceeded.

Progress Reports are required in the intervening years between the three-yearly Updating and Screening Assessment reports. Their purpose is to maintain continuity in the Local Air Quality Management process

Where the Progress Report has identified a risk that an air quality objective will be exceeded at a location with relevant public exposure, the Local Authority is still required to undertake a Detailed Assessment. The aim being to identify with reasonable certainty, whether or not a likely exceedence will occur.

- Gedling Borough Council has examined the results from monitoring in the borough. Concentrations for all pollutants except NO_2 are below the objectives, therefore there is no need to proceed to a Detailed Assessment.

- Gedling Borough Council has measured concentrations of NO_2 above the annual mean objective at relevant locations; **this data is being fed into a Further Assessment, for the A60 Mansfield Road.**

- Gedling Borough Council confirms that there are no new or newly identified local developments which may have an impact on air quality within the Local Authority area.

Gedling Borough Council proposes no further action as a result of this Progress Report. The Council is currently beginning the process of producing a Further Assessment and Action Plan for NO_2 along the A60 Mansfield Road; data from this report will be fed into this assessment.

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1 Introduction

1.1 Description of Local Authority Area

Established in 1974, the Borough of Gedling is home to 112,000 people and covers an area of 46.3 square miles. It borders Sherwood Forest to the north, the River Trent to the south-east and the City of Nottingham to the south-west.

The main urban areas of Arnold, Carlton, Gedling, Netherfield and Mapperley form part of the Nottingham conurbation and contain the largest proportion of population and industry. The other major villages are Ravenshead, Calverton, Burton Joyce, Newstead Village and Woodborough.

The major area for industry lies to the south of the Borough at the Colwick Industrial Estate, an assortment of other light industry occurs throughout the Borough. Agriculture is also an important industry, particularly to the north.

The local authorities bordering Gedling are Ashfield District Council, Newark and Sherwood District Council, Nottingham City Council and Rushcliffe Borough Council.

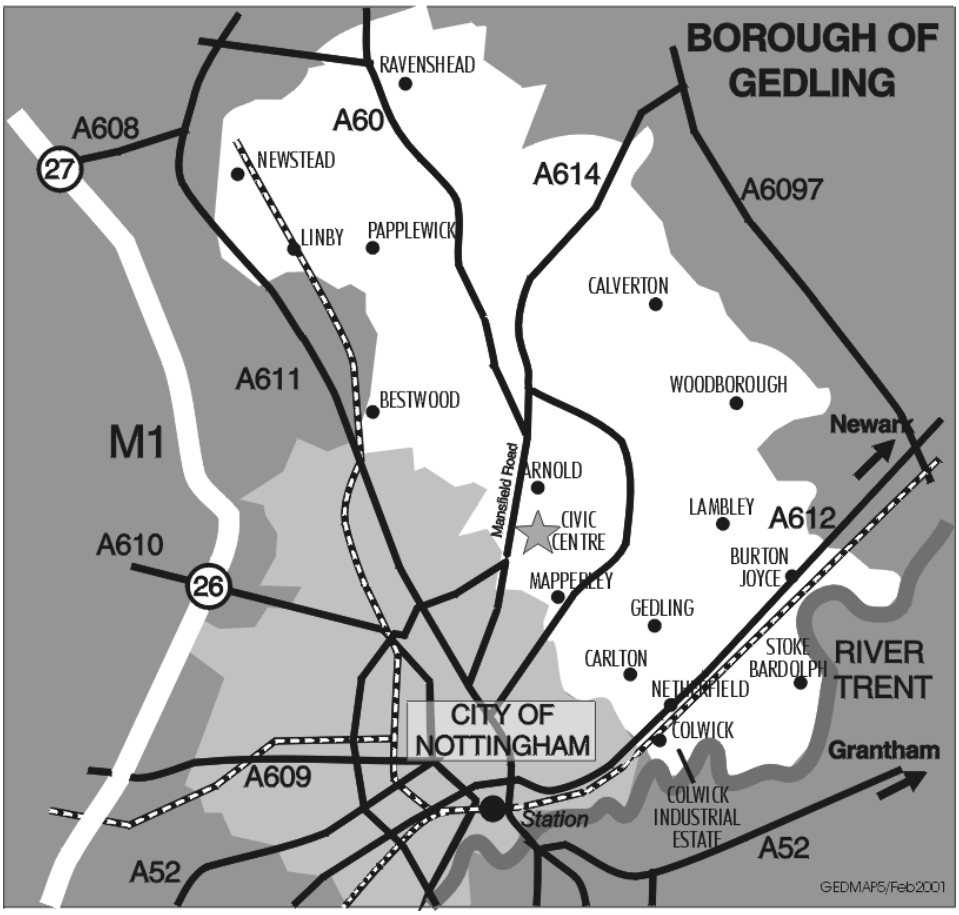

Figure 1.1 Gedling Borough Location Plan

1.2 Purpose of Progress Report

Progress Reports are required in the intervening years between the three-yearly Updating and Screening Assessment reports. Their purpose is to maintain continuity in the Local Air Quality Management process.

They are not intended to be as detailed as Updating and Screening Assessment Reports, or to require as much effort. However, if the Progress Report identifies the risk of exceedence of an Air Quality Objective, the Local Authority (LA) should undertake a Detailed Assessment immediately, and not wait until the next round of Review and Assessment.

1.3 Air Quality Objectives

The air quality objectives applicable to Local Air Quality Management (LAQM) **in England** are set out in the Air Quality (England) Regulations 2000 (SI 928), and the Air Quality (England) (Amendment) Regulations 2002 (SI 3043). They are shown in Table 1.1. This table shows the objectives in units of micrograms per cubic metre $\mu g/m^3$ (for carbon monoxide the units used are milligrammes per cubic metre, mg/m^3). Table 1.1. includes the number of permitted exceedences in any given year (where applicable).

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

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

1.4 Summary of Previous Review and Assessments

Table 1.2 Summary of LAQM Reports 2003 – 2010

Report	Conclusions/Actions
2003 Updating and Screening Assessment	No Further Assessment Required
2004 Progress Report	No Further Assessment Required
2005 Progress Report	Progress to DA for NO_2 A60 Mansfield Rd. Daybrook
2006 Detailed Assessment	***"A60 Mansfield Road, Daybrook*** *The results from the monitoring and modelling carried out to date would tend to indicate that Nitrogen Dioxide levels along the A60 Mansfield Road are below the annual objective of 40µg/m^3.* *The area is however, of continual concern and therefore Gedling Borough will continue to monitor levels along this road. Gedling Borough will also review the configuration of the co-located diffusion tubes, which may be a contributing factor to the large differences between national and local bias adjustment studies."*
2006 Updating and Screening Assessment	Progress to DA for NO_2 A60 Mansfield Rd. B684 Woodborough Rd/Plains Rd C168 Victoria Road
2007 Detailed Assessment	***"A60 Mansfield Road, Daybrook*** *Overall results from the monitoring and modelling carried out to date would tend to indicate that Nitrogen Dioxide levels along the A60 Mansfield Road are below the annual objective of 40µg/m^3. Therefore we do not consider it necessary to declare an Air Quality Management Area at this time. The area is however, of continual concern and therefore Gedling Borough will continue to monitor levels along this road.* ***B684 Woodborough/Plains Road, Mapperley*** *Results from the additional monitoring and modelling carried out to date would tend to indicate that Nitrogen Dioxide levels along the B684 Woodborough/Plains Road, Mapperley are below the annual objective of 40µg/m^3. Therefore we do not consider it necessary to declare an Air Quality Management Area at this time. The area is however, of continual concern and therefore Gedling Borough will continue to monitor levels along this road.* *contd.*

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Report	Conclusions/Actions
2007 Detailed Assessment contd.	***C168 Victoria Road, Netherfield*** *Results from the additional monitoring and modelling carried out to date would tend to indicate that Nitrogen Dioxide levels along the C168 Victoria Road, Netherfield are below the annual objective of 40µg/m^3. Therefore we do not consider it necessary to declare an Air Quality Management Area at this time. The area is however, of continual concern and therefore Gedling Borough will continue to monitor levels along this road."*
2008 Progress Report	No Further Assessment Required
2009 Updating and Screening Assessment	Progress to DA for NO_2 - A60 Mansfield Rd.
2010 Progress Report	No Further Assessment Required
2010 Detailed Assessment	*It is considered that, on balance, the objective for Nitrogen Dioxide is likely to be exceeded along the A60 Mansfield Road between its junction with Thackerays Lane and Oxclose Lane. Based on the contour models this would equate to approximately 50 residential properties exposed to pollutant concentrations above the objective.* *Therefore, it is proposed that GBC declare an Air Quality Management Area (AQMA) for Nitrogen Dioxide*

Note: The AQMA order for the A60 Mansfield Road was made on 1st April 2011.

2 New Monitoring Data

2.1 Summary of Monitoring Undertaken

2.1.1.1 Automatic Monitoring Sites

Gedling Borough has one analyser measuring NOx and NO to calculate a value of NO_2.

During 2001-2007 the analyser was housed in the basement of the Daybrook Baptist Chapel, Daybrook Square (see maps in appendix A). This site provided a safe and secure, dry location with a constant temperature and electrical supply. In January of 2008 however, the analyser was moved to a Casella ROMON enclosure on the opposite side of the A60 Mansfield Road, still in Daybrook Square.

The new enclosure is situated approximately 5 metres from the kerb to best represent the receptors located 75 metres further along the road, given the constraints for siting.

Figure 2.1 Location of ROMON enclosure, Daybrook Square

Table 2.1 Details of Automatic Monitoring Site

Site Name	Site Type	OS Grid Ref	Pollutants Monitored	In AQMA?	Relevant Exposure?	Distance to kerb of nearest road	Worst-case Location?
Daybrook Square	Roadside	X 457944 Y 344596	NOx / NO_2	Y	N (75m)	5 metres	N

2.1.1.2 Non-Automatic Monitoring

Nitrogen Dioxide Diffusion Tubes

Gedling Borough has 23 diffusion tubes spread along the key areas of concern, which are mainly commuter routes into Nottingham City Centre. The Borough also has three urban background and one rural background tube(s).

In 2004 most of the tubes were moved to new locations that better reflected the "receptor" based risk assessment criteria of guidance. The three tubes, Daybrook Analyser I, II and III, are located at the sampling head of the continuous automatic analyser. (See location maps in Appendix A)

Following the recommendations of the 2009 USA report three additional tubes were placed at relevant locations along the critical section through Daybrook Square, from July 2009.

Details of the co-location study and subsequent bias adjustment can be found in Appendix B, along with full monitoring results. QA/QC procedures and laboratory details can be found in Appendix C.

Benzene Diffusion Tubes

Gedling Borough Council does monitor for Benzene using a small number of BTex passive diffusion tubes. BTex tubes are small metal tubes open at one end with a pollutant-absorbing chemical matrix at the closed end. At site, the tube is exposed, by removal of the end cap, for a period of one month. After the month the tube is resealed and sent to an analytical laboratory.

BTex tube results are for benzene, toluene, ethyl-benzene and xylene. The concentrations of the other pollutants can be used to validate the benzene results as local conditions may affect the results i.e. high levels of solvents from industrial processes. Benzene concentrations measured in micrograms per cubic metre (μgm^3).

Tubes are located around the TotalFinaElf Storage Depot, Private Road No. 3, Colwick Industrial Estate and also Chaworth Road and Bourne Mews which have been identified as a possible receptors for exceedence of the 2010 objective. A single tube is also placed in the north of the Borough as a rural background site. (See Maps in Appendix A)

Table 2.2 Details of Non- Automatic Monitoring Sites

Site Name	Site Type	OS Grid Ref	Pollutants Monitored	In AQMA?	Relevant Exposure?	Distance to kerb of nearest road	Worst-case Location?
Marion Murdoch Court	Urban Background	X 461294 Y 342826	NO_2	N	N/A	N/A	N/A
Hastings Street	Urban Background	X 460391 Y 341413	NO_2	N	N/A	N/A	N/A
856 Plains Road	Receptor	X 458898 Y 343139	NO_2	N	Y	8m	Y
Morley Mills Building	Receptor	X 457969 Y 344780	NO_2	Y	Y	3m	Y
Mansfield Road, Redhill	Near Receptor	X 457899 Y 345637	NO_2	Y	N (25m)	10m	N
Daybrook Dental Surgery	Receptor	X 457867 Y 345388	NO_2	Y	N (30m)	2.3m	Y
19 Victoria Road	Receptor	X 461995 Y 341175	NO_2	N	Y	4m	Y
36 Victoria Road	Roadside	X 462002 Y 341097	NO_2	N	N (4.5m)	1.5m	Y
47 Plains Road	Receptor	X 459244 Y 343549	NO_2	N	Y	7m	Y
Daybrook Analyser	Reference to Analyser	X 457974 Y 344632	NO_2	Y	N/A	5m	N/A
Burton Rd/Shearing Hill	Near Receptor	X 462422 Y 341972	NO_2	N	N (9m)	16m	N
The Vale PH	Roadside	X 457929 Y 344335	NO_2	Y	N (14m)	3.5m	N
The Grove PH	Near Receptor	X 457947 Y 344651	NO_2	Y	N (16m)	3.5m	Y
Ricket Lane	Rural Background	X 456621 Y 355935	NO_2	N	N/A	N/A	N/A
Wickes Store, Daybrook	Near Receptor	X 458364 Y 345280	NO_2	Y	N (50m)	3m	N
Civic Centre, Arnold	Urban Background	X 458662 Y 345618	NO_2	N	N/A	N/A	N/A
Mile End Road	Near Receptor	X 461103 Y 340086	NO_2	N	Y	10m	Y
Daybrook Chip Shop	Near Receptor	X 457947 Y 344713	NO_2	Y	Y	3m	Y
T&S Heating, Daybrook	Near Receptor	X 457950 Y 344748	NO_2	Y	Y	3m	Y
Frank Keys, Daybrook	Near Receptor	X 457969 Y 344827	NO_2	Y	Y	3m	Y
Private Road No3	Urban Industrial	X 462142 Y 340384	BTex	N	N/A	N/A	N/A
Bourne Mews	Urban Background	X 462125 Y 340874	BTex	N	Y	N/A	Y
Ricket Lane	Rural	X 456621 Y 355935	BTex	N	N/A	N/A	N/A
Hollyoake Villas	Receptor	X 461795 Y 340703	BTex	N	Y	N/A	Y

2.2 Comparison of Monitoring Results with Air Quality Objectives

The results of 2010 monitoring for nitrogen dioxide and benzene have been compared against air quality objectives.

2.2.1 Nitrogen Dioxide

Automatic Monitoring Data

Results for automatic monitoring for 2010 show no exceedences of the air quality objectives for NO_2. Figure 2.3 shows a slight increase in NO_2 levels over a seven year period (2004-2010).

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

Location	Within AQMA?	Data Capture for full calendar year 2010 %	Annual mean concentrations (μg/m^3)				
			2006	2007	2008	2009	2010
Daybrook Square	Y	95	35	32	34	36	39

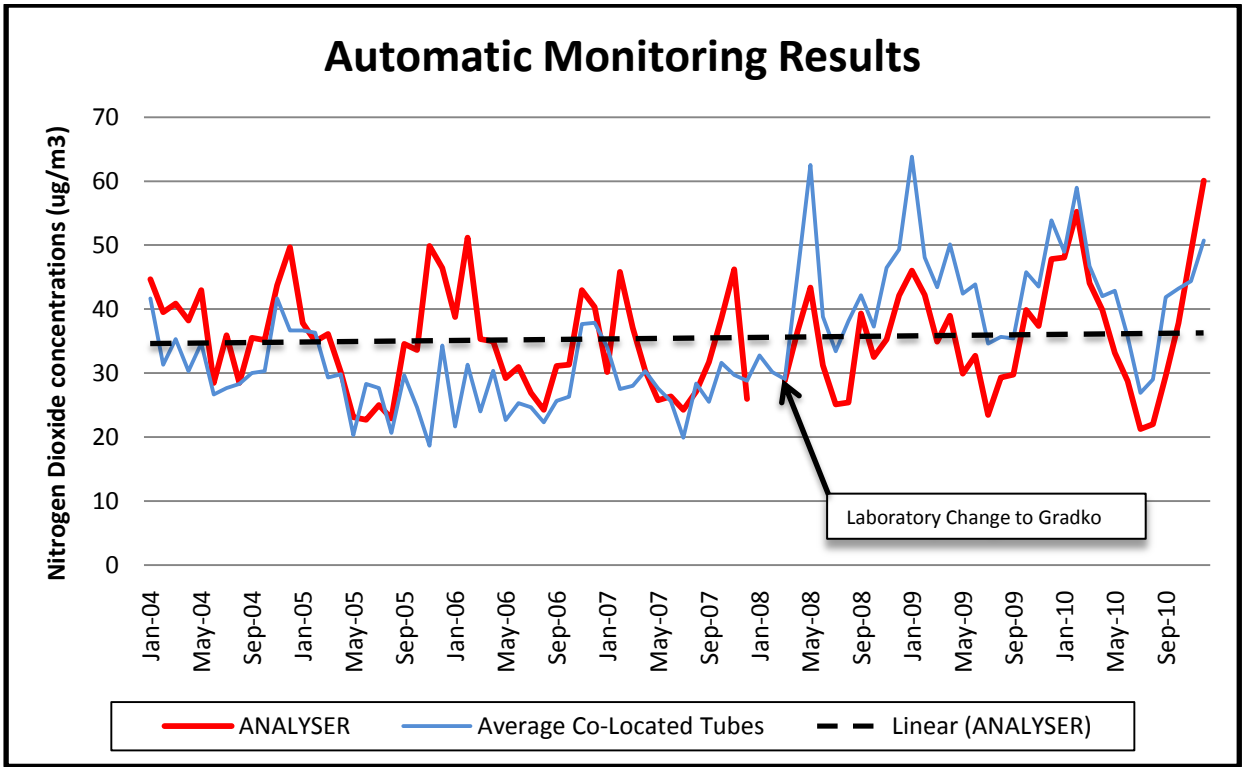


Figure 2.3 Trends in Monthly Mean Nitrogen Dioxide Concentration Daybrook Square.

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

Location	Within AQMA?	Data Capture for full calendar year 2010 %	Number of Exceedences of hourly mean (200 μg/m^3) *If the period of valid data is less than 90% of a full year, include the 99.8th percentile of hourly means in brackets.*		
			2008*	2009	2010
Daybrook Square	Y	95	0 (127)	0	1

*10 months of data

Diffusion Tube Monitoring Data

The results of diffusion tube monitoring for 2010 (Table 2.4) show some exceedences of the air quality objectives at receptors along the A60 Mansfield Road: Full diffusion tube monitoring dataset, including details of bias and location adjustments are available in Appendix B.

Table 2.4 Results of Nitrogen Dioxide Diffusion Tubes (adjusted for bias and location)

Site ID	Location	Within AQMA?	Data Capture for monitoring period %	Data Capture for full calendar year 2010 %	Annual mean concentrations (μg/m^3)		
					2008†	2009††	2010
G1	Marion Murdoch Court	N	n/a	100	19	21	21
G2	Hastings Street	N	n/a	100	23	24	24
G3	856 Plains Road	N	n/a	100	31	30	31
G4	Morley Mills Building	Y	n/a	100	**40**	**40**	38
G5	Mansfield Road, Redhill	Y	n/a	100	27	32	29
G6	Daybrook Dental Surgery	Y	n/a	100	37	37	37
G7	19 Victoria Road	N	n/a	100	32	33	32
G8	36 Victoria Road	N	n/a	100	35	33	31
G9	47 Plains Road	N	n/a	100	31	32	32
G13	Burton Rd/Shearing Hill	N	n/a	92	24	26	27
G14	The Vale PH	Y	n/a	100	34	34	33
G15	The Grove PH	Y	n/a	100	**40**	38	**42**
G16	Ricket Lane	N	n/a	100	18	19	16
G17	Wickes Store, Daybrook	Y	n/a	92	34	36	35
G18	Civic Centre, Arnold	N	n/a	100	20	21	23
G19	Mile End Road	N	n/a	100	27	27	30
G20	Daybrook Chip Shop	Y	n/a	92	-	**48**	**44**
G21	T&S Heating, Daybrook	Y	n/a	92	-	**49**	**45**
G22	Frank Keys, Daybrook	Y	n/a	100	-	**43**	**41**

† 9 months of data.
†† 6 month data has been “annualised” using Box 3.2 of TG(09).

Figure 2.4 shows a series of graphs plotting diffusion tube results over a 33 month period (2008 – 2010), the results since the change to Gradko laboratory. These graphs split into urban/background sites, Mansfield Road sites and Plains/Woodborough Road sites show:

- The trendline for the indicative urban background site shows an increasing trend over time in the levels of NO_2.
- The trendline for the indicative Mansfield Road site shows a flat response over time in the levels of NO_2.
- The trendline for the indicative Plains Road site shows a slight increasing trend over time in the levels of NO_2.

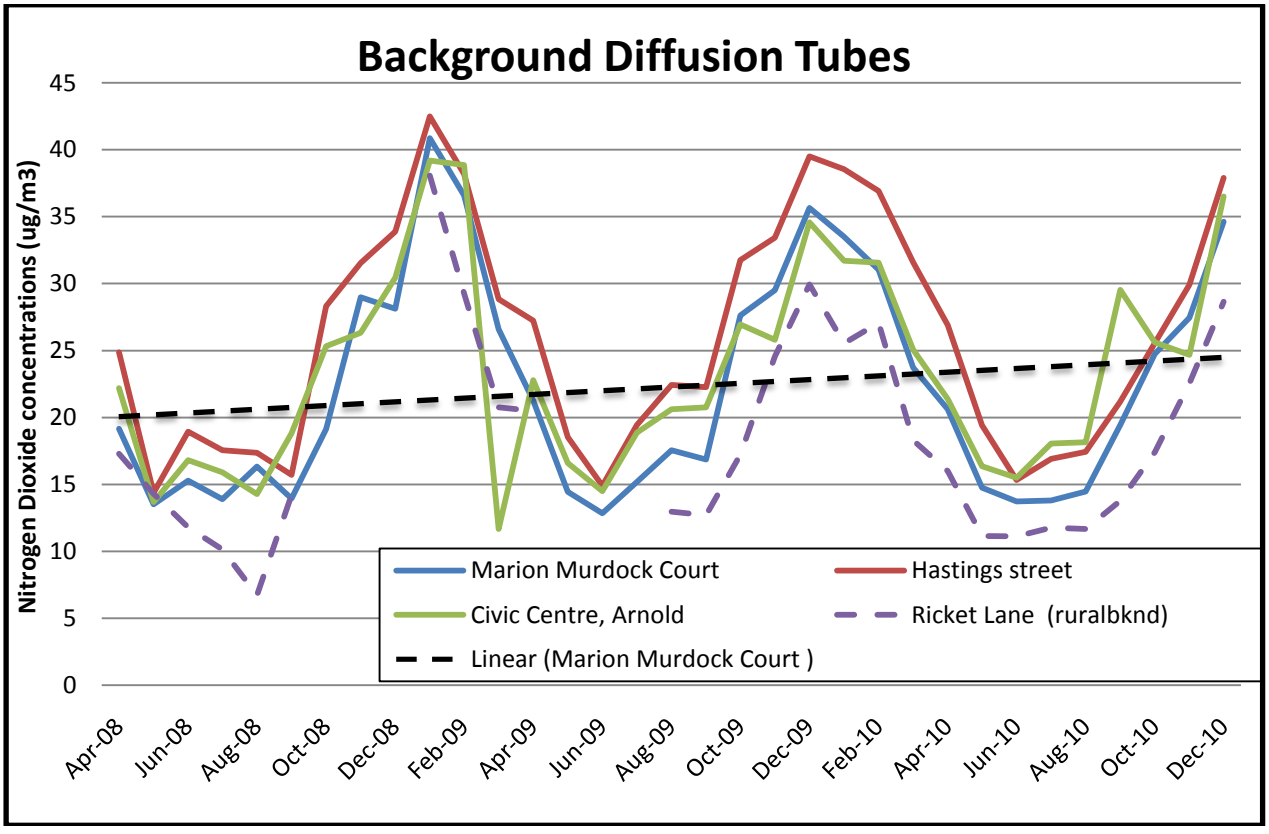
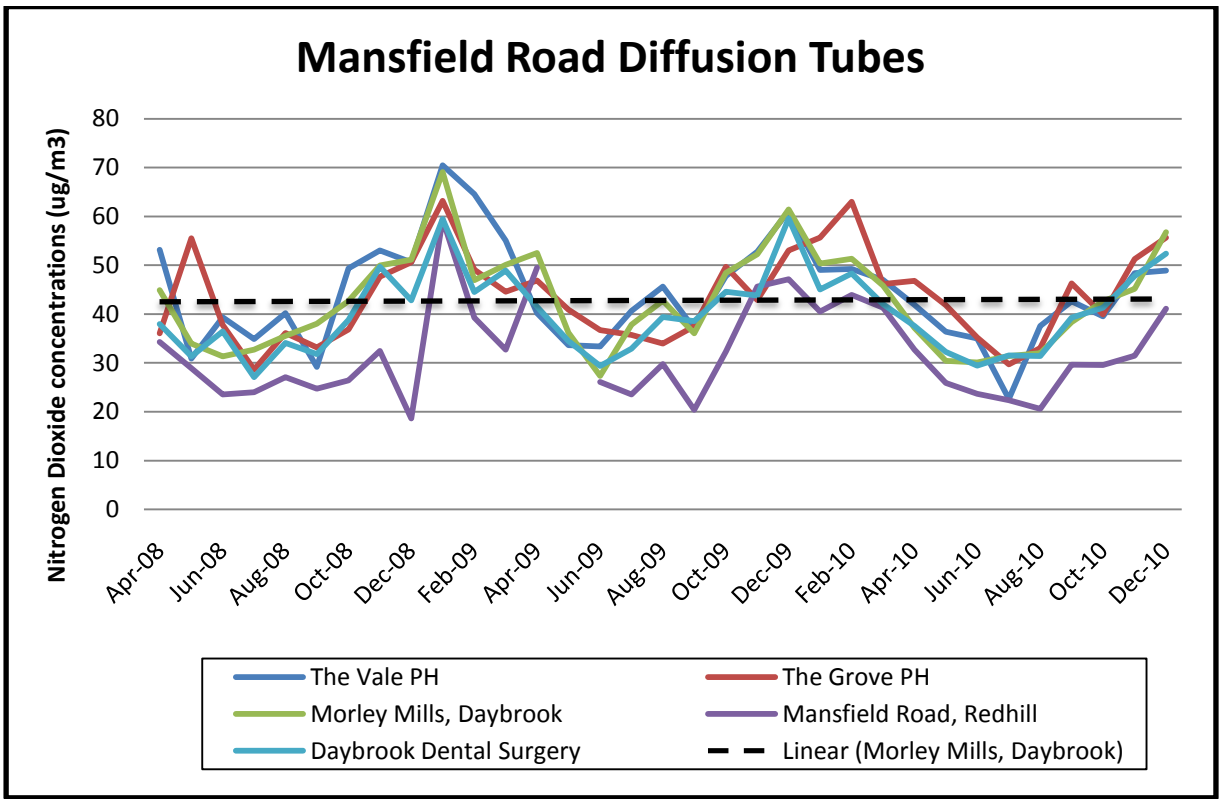


Figure 2.4 Trends in Annual Mean Nitrogen Dioxide Concentration Measured at Diffusion Tube Monitoring Sites.



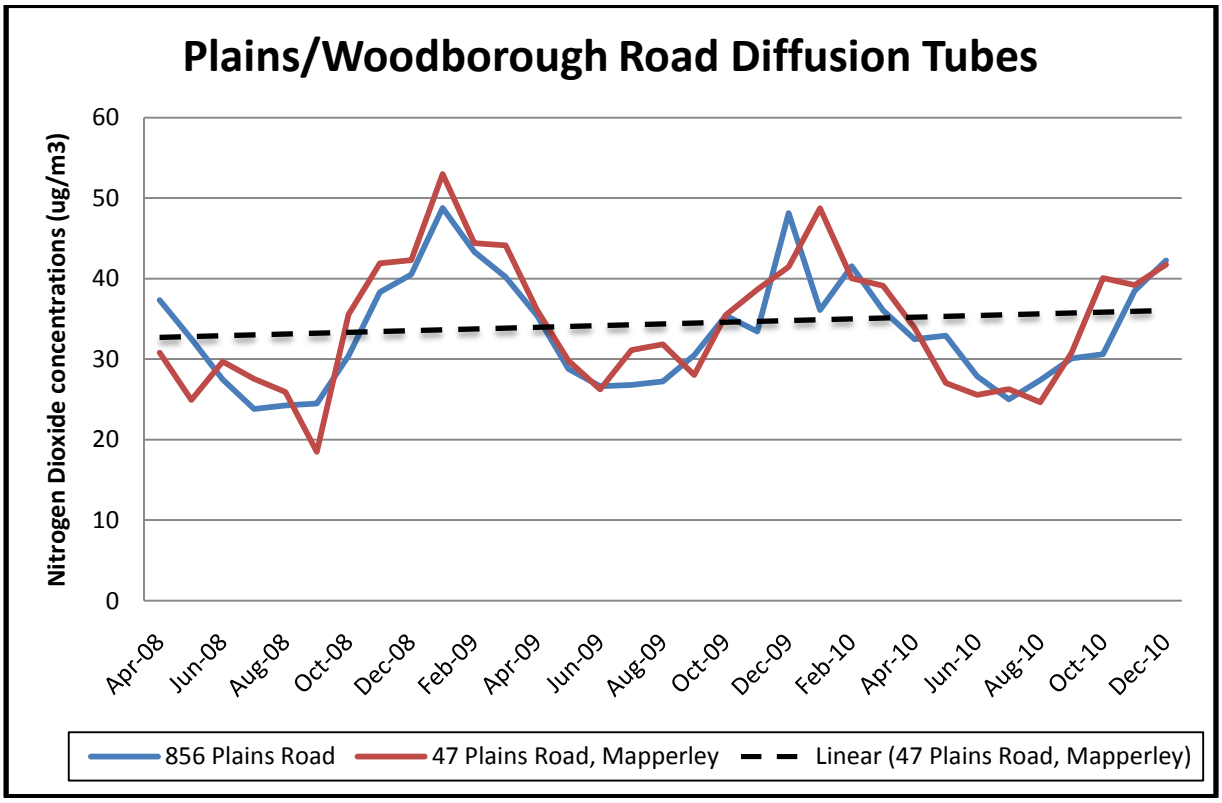


Figure 2.4 contd. **Trends in Annual Mean Nitrogen Dioxide Concentration Measured at Diffusion Tube Monitoring Sites.**

2.2.2 PM_{10}

Gedling Borough Council does not monitor for PM_{10}.

2.2.3 Sulphur Dioxide

Gedling Borough Council does not monitor for Sulphur Dioxide.

2.2.4 Benzene

Table 2.5 shows monitoring results for the past three years, no exceedences of the benzene air quality 2010 objective were measured (5.00 µg/m^3).

Table 2.5 Results of BTex Diffusion Tubes

Location	Annual mean concentrations (µg/m^3)		
	2008	2009	2010
Private Road No.3	0.92	0.90	0.66
Bourne Mews	0.85	0.49	0.76
Ricket Lane (rural backgnd)	0.85	0.59	0.79
Hollyoake Villas	0.98	0.79	0.89

2.2.5 Other pollutants monitored

No other pollutants monitored.

2.2.6 Summary of Compliance with AQS Objectives

Gedling Borough Council has examined the results from monitoring in the borough. Concentrations for all pollutants except NO_2 are below the objectives, therefore there is no need to proceed to a Detailed Assessment.

Gedling Borough Council has measured concentrations of NO_2 above the annual mean objective at relevant locations; **this data is being fed into a Further Assessment, for the A60 Mansfield Road.**

3 New Local Developments

3.1 Road Traffic Sources

No significant change since the Progress Report 2010.

3.2 Other Transport Sources

No significant change since the Progress Report 2010.

3.3 Industrial Sources

No significant change since the Progress Report 2010.

3.4 Commercial and Domestic Sources

No significant change since the Progress Report 2010.

3.5 New Developments with Fugitive or Uncontrolled Sources

No significant change since the Progress Report 2010.

Gedling Borough Council confirms that there are no new or newly identified local developments which may have an impact on air quality within the Local Authority area.

4 Local / Regional Air Quality Strategy

In 2008 an air quality strategy for Nottinghamshire was published by the LA's in partnership with the Highways Agency, Environment Agency and the Health Protection Agency.

The document was designed to *"to help local authorities and partner organisations manage and improve ambient air quality and to protect the health and wellbeing of the public in a co-ordinated and integrated manner. In practice, having identified priorities to control air emissions and consulted the public on what action they might be prepared to take to minimise air pollution, the framework is a working document to provide and focus actions to improve air quality in Nottinghamshire."*

The document is available through all LA websites in Nottinghamshire:

http://www.gedling.gov.uk/notts_aq_strategy_2008.pdf

The document is designed to be a framework for improvement over a ten year period.

5 Planning Applications

In the 2009 USA two major planning applications were described: the Gedling Access Road and the Gedling Colliery Development (see Appendix A).

The applications were submitted in 2008 (ref: 2008/0459 and 2008/0460); since this time the project has been delayed whilst funding is obtained, particularly for the Access Road. Consequently no further assessments have been submitted above and beyond the initial Environmental Statement.

Two applications for mine gas engines have recently been received:

1. Former Calverton Colliery (2010/1097NCC) – a single 1.6 MWe mine-gas engine.

2. Former Gedling Colliery (2010/1033NCC) – two 1.6 MWe mine-gas engines.

Both applications have included an air quality assessment both of which have indicated no exceedences of the air quality objectives at the nearest receptors.

6 Conclusions and Proposed Actions

6.1 Conclusions from New Monitoring Data

Gedling Borough Council has examined the results from monitoring in the borough. Concentrations for all pollutants except NO_2 are below the objectives, therefore there is no need to proceed to a Detailed Assessment.

Gedling Borough Council has measured concentrations of NO_2 above the annual mean objective at relevant locations, and **is in the process of carrying out a Further Assessment**, for the A60 Mansfield Road.

6.2 Conclusions relating to New Local Developments

Gedling Borough Council confirms that there are no new or newly identified local developments which may have an impact on air quality within the Local Authority area.

6.3 Proposed Actions

Gedling Borough Council proposes no further action as a result of this Progress Report. The Council is currently producing a Further Assessment for NO_2 along the A60 Mansfield Road; data from this report will be fed into this assessment.

Gedling Borough Council will next submit a 2012 Updated Screening Assessment.

7 References

Part IV of the Environment Act 1995 - Local Air Quality Management: Policy Guidance; LAQM.PG(09); Department for Environment and Food and Rural Affairs; 2009.

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A Breath of Fresh Air for Nottinghamshire; The Nottinghamshire Environmental Protection Working Group, 2008

Appendices

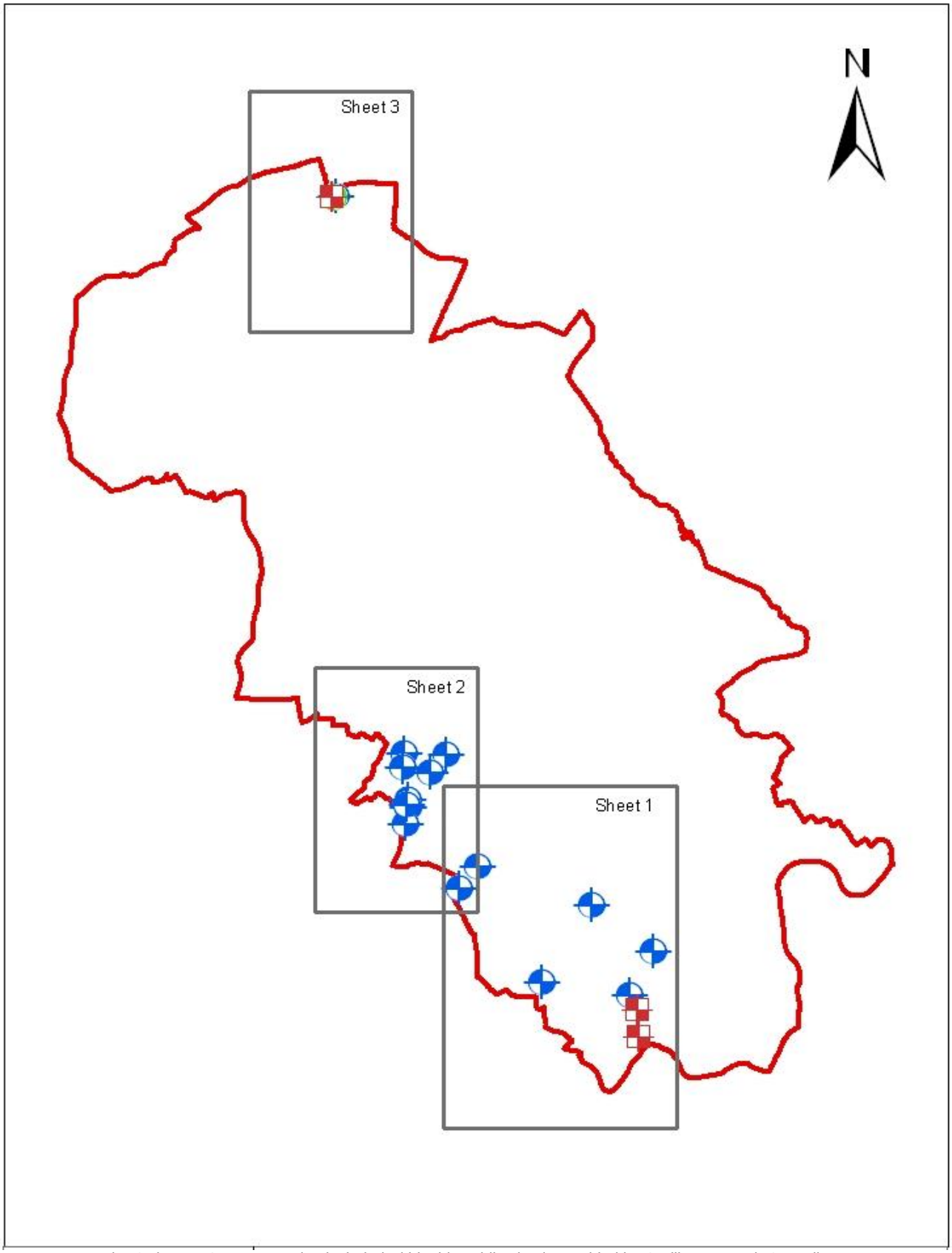
Appendix A: Maps

Appendix B: Nitrogen Dioxide Diffusion Tube Results and Bias Adjustment Details

Appendix C: QA/QC Data

Appendix A

Maps



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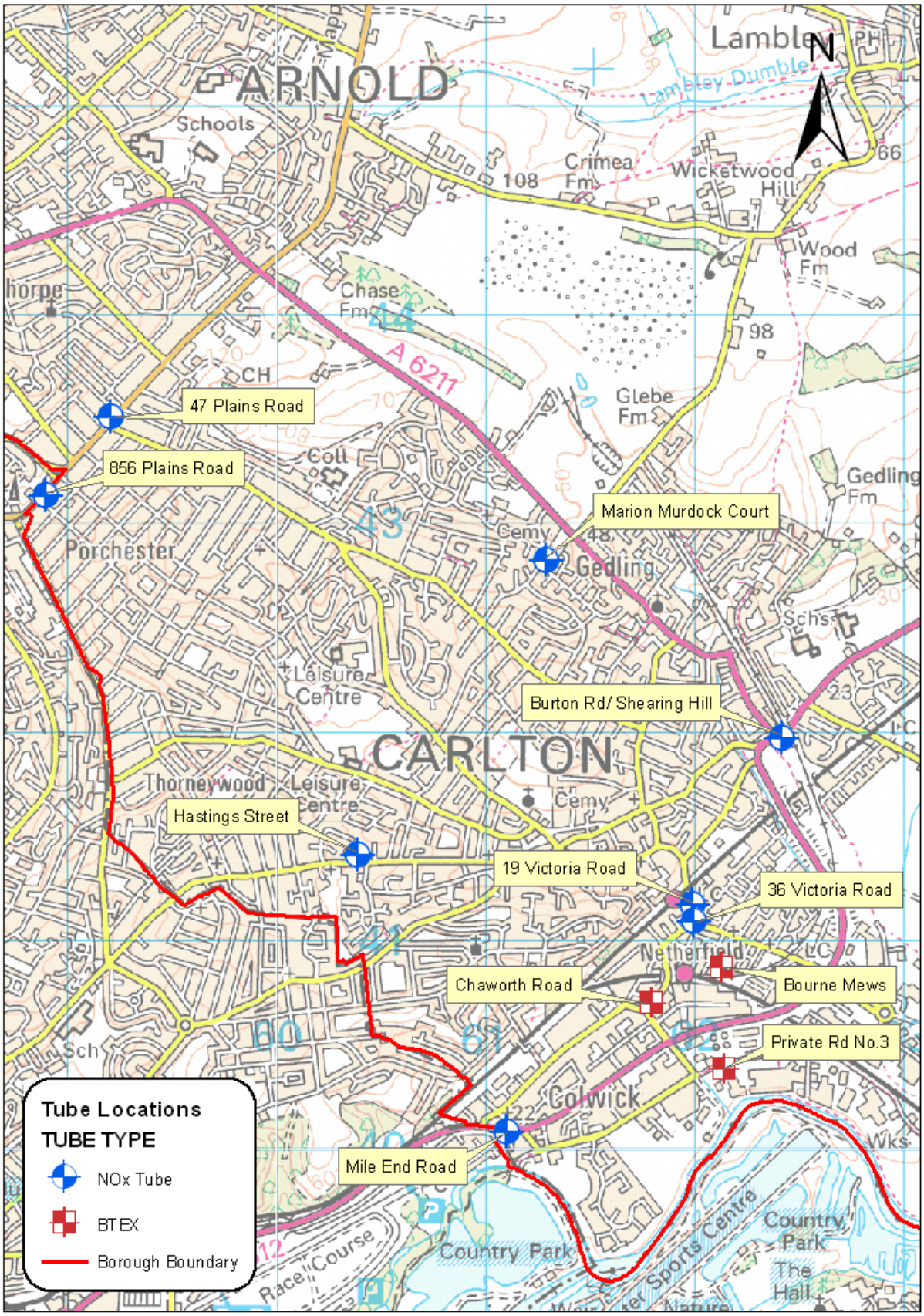

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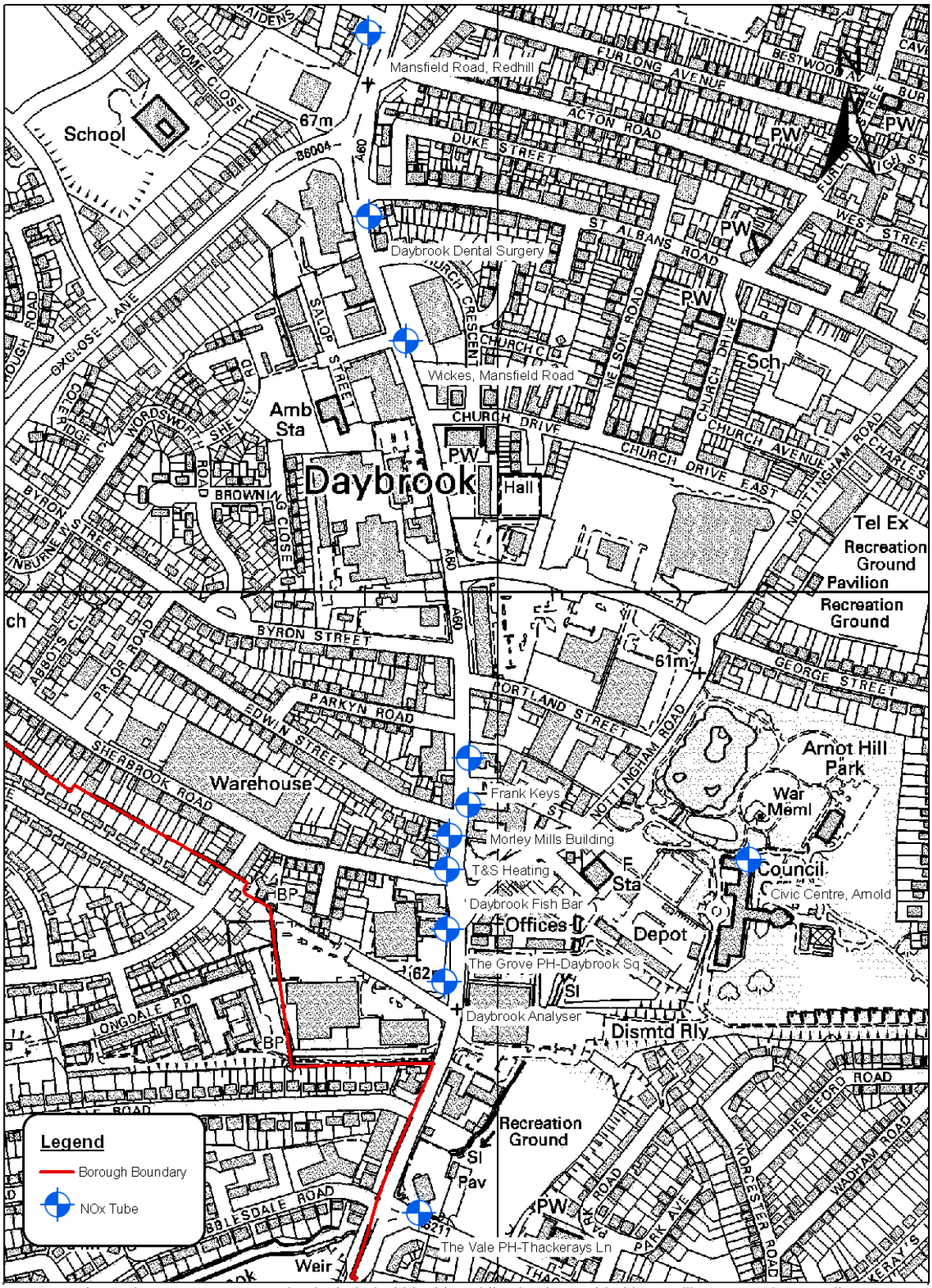

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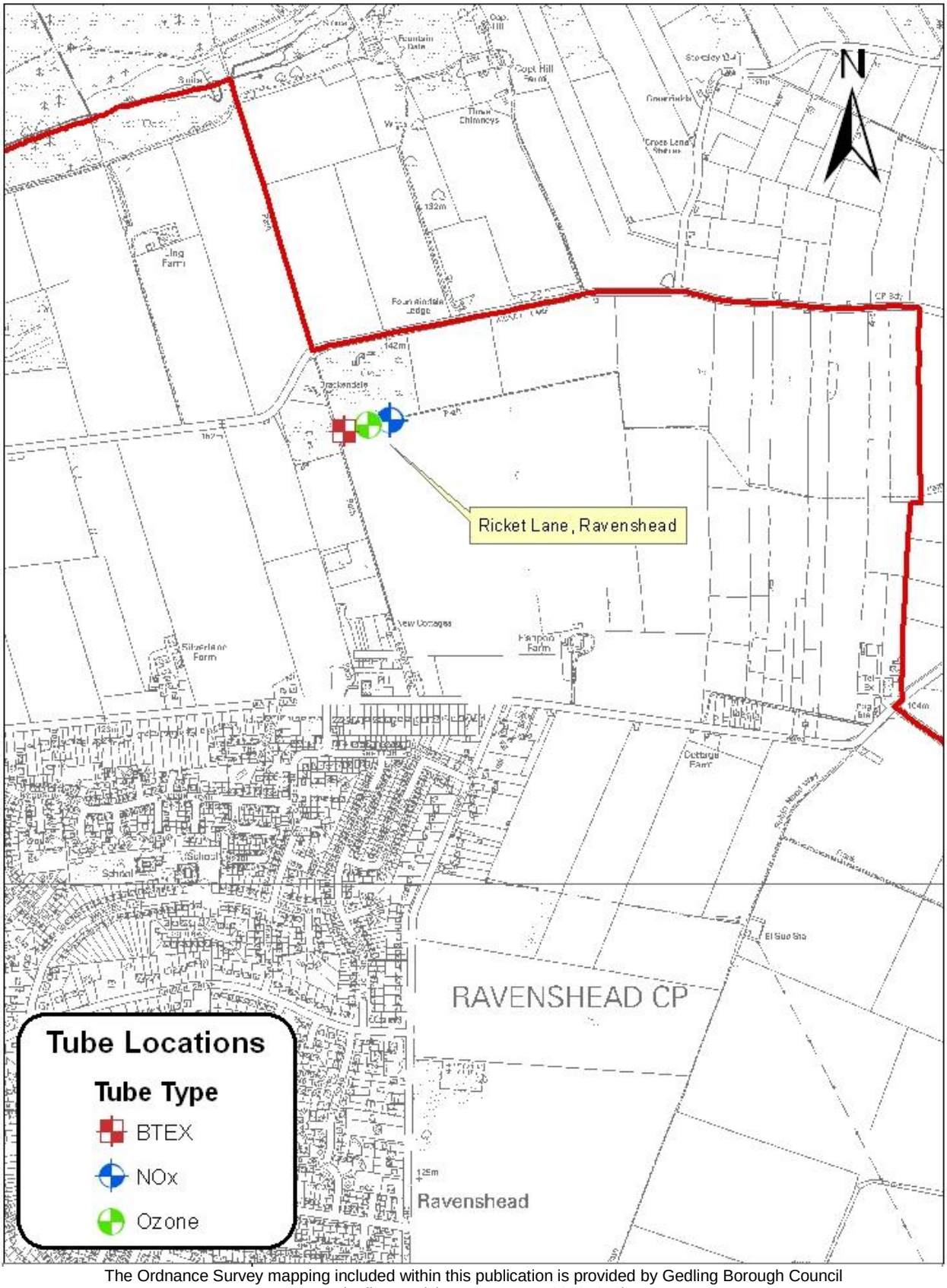

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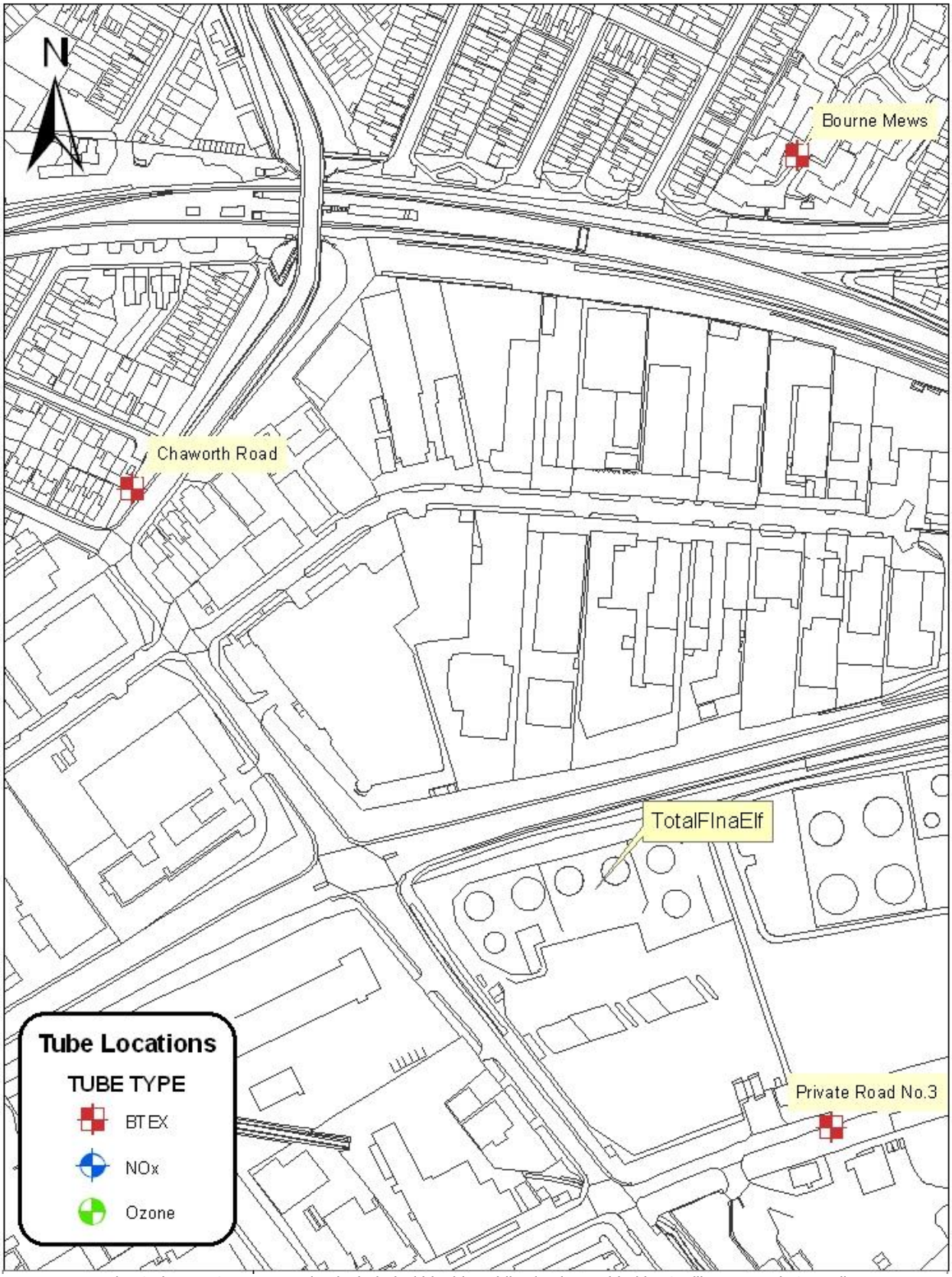
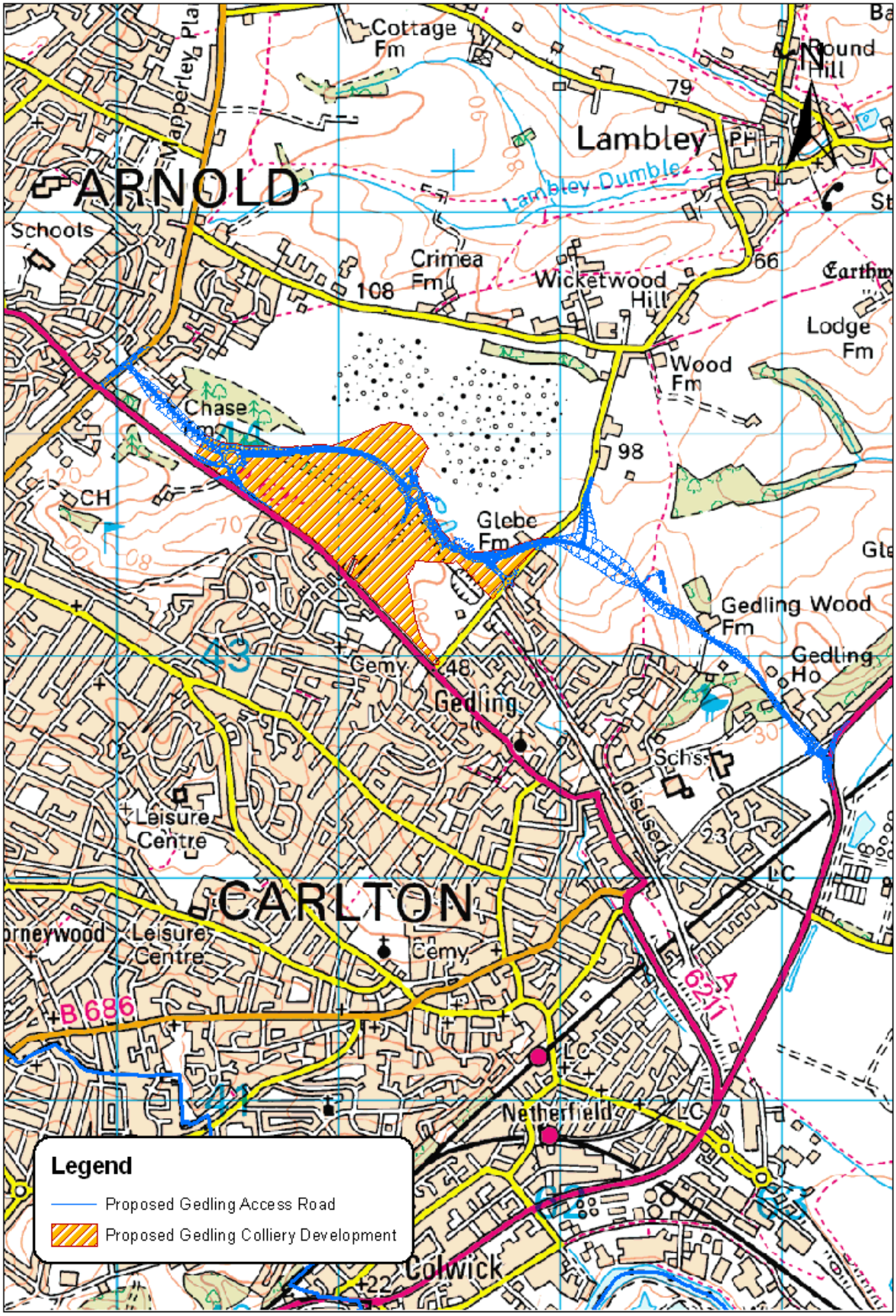


Title:	April 2011
Btex Diffusion Tubes around TotalFinaElf	Scale: nts



Title:	April 2011
Proposed Gedling Colliery Development	Scale: nts

Appendix B

Nitrogen Dioxide Diffusion Tube Results And Bias Adjustment Details

Diffusion Tube Bias Adjustment Factors

National Bias Adjustment Factors (BAF) have been obtaining using the co-location studies spreadsheet available at http://laqm.defra.gov.uk/bias-adjustment-factors/bias-adjustment.html

The Gradko national BAF 2010 for 20% TEA in water is given as **0.92** from 39 studies of various types. (see screen shot in this appendix)

Factor from Local Co-location Studies

A co-location study has been carried out with the GBC NOx analyser.

Attached to this appendix the AEA spreadsheet for calculating bias, precision and accuracy of triplicate tubes. The bias factor calculated is **0.92**.

Discussion of Choice of Factor to Use

In this instance both factors are **0.92**.

Adjustment for Receptor Distance

Two of the diffusion tube locations are not representative of the receptors concerned:

1. 36 Victoria Road
2. The Vale PH

Due to site constraints the tubes are located as close as possible to the receptors. The two results have therefore been adjusted using the 'NO_2 with distance from roads' spreadsheet; available at http://laqm.defra.gov.uk/tools-monitoring-data/no2-falloff.html

Screen shots of these spreadsheets are attached to this appendix.

Checking Precision and Accuracy of Triplicate Tubes

AEA Energy & Environment
From the AEA group

Diffusion Tubes Measurements									
Period	Start Date dd/mm/yyyy	End Date dd/mm/yyyy	Tube 1 μgm^{-3}	Tube 2 μgm^{-3}	Tube 3 μgm^{-3}	Triplicate Mean	Standard Deviation	Coefficient of Variation (CV)	95% CI of mean
1	30/12/2009	03/02/2010	48.0	52.1	46.8	49	2.8	6	6.9
2	03/02/2010	26/02/2010	58.9	57.7	60.2	59	1.3	2	3.1
3	26/02/2010	31/03/2010	48.4	46.9	44.9	47	1.8	4	4.4
4	31/03/2010	27/04/2010	40.3	41.4	44.4	42	2.1	5	5.2
5	27/04/2010	02/06/2010	43.4	41.9	43.3	43	0.8	2	2.0
6	02/06/2010	30/06/2010	30.1	38.6	38.4	36	4.8	14	12.0
7	30/06/2010	04/08/2010	25.9	26.4	28.5	27	1.4	5	3.4
8	04/08/2010	01/09/2010	30.1	28.7	28.2	29	1.0	3	2.5
9	01/09/2010	29/09/2010	42.1	40.7	42.8	42	1.1	3	2.7
10	29/09/2010	03/11/2010	49.0	37.4	43.3	43	5.8	13	14.3
11	03/11/2010	06/12/2010	43.3	45.4		44	1.5	3	13.5
12	06/12/2010	05/01/2011	54.6	45.2	52.3	51	4.9	10	12.3
13									

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

Automatic Method	
Period Mean	Data Capture (% DC)
48	97
55	97
44	97
40	97
33	92
29	75
21	97
22	97
30	95
38	97
49	96
60	97

Data Quality Check	
Tubes Precision Check	Automatic Monitor Data
Good	Good
Good	Good
Good	Good
Good	Good
Good	Good
Good	Good
Good	Good
Good	Good
Good	Good
Good	Good
Good	Good
Good	Good
Good precision	Good Overall DC

Overall survey -->

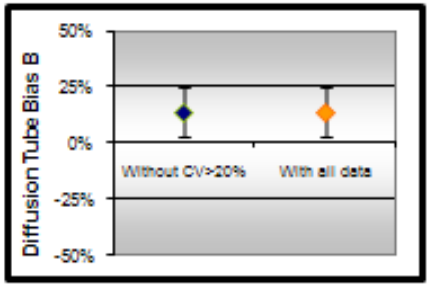
(Check average CV & DC from Accuracy calculations)

Site Name/ ID:	Daybrook Square

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

Accuracy (with 95% confidence interval)	
without periods with CV larger than 20%	
Bias calculated using 12 periods of data	
Bias factor A	0.92 (0.83 - 1.02)
Bias B	9% (-2% - 20%)
Diffusion Tubes Mean:	43 μgm^{-3}
Mean CV (Precision):	6
Automatic Mean:	39 μgm^{-3}
Data Capture for periods used:	95%
Adjusted Tubes Mean:	39 (35 - 43) μgm^{-3}

Accuracy (with 95% confidence interval)	
WITH ALL DATA	
Bias calculated using 12 periods of data	
Bias factor A	0.92 (0.83 - 1.02)
Bias B	9% (-2% - 20%)
Diffusion Tubes Mean:	43 μgm^{-3}
Mean CV (Precision):	6
Automatic Mean:	39 μgm^{-3}
Data Capture for periods used:	95%
Adjusted Tubes Mean:	39 (35 - 43) μgm^{-3}



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Version 03 - November 2006

Co-Location Spreadsheet 2010

Adjustment of SINGLE Tubes

AEA Energy & Environment
From the AEA group

Diffusion Tube Measurements															
Site Name/ID	Periods													Raw Mean	Valid periods
	1	2	3	4	5	6	7	8	9	10	11	12	13		
Marion Murdock Court	33.5	31.0	23.7	20.6	14.8	13.7	13.8	14.5	19.5	24.7	27.5	34.6		22.7	12
Hastings Street	38.5	36.9	31.6	26.9	19.4	15.3	16.9	17.4	21.2	25.6	29.9	37.9		26.5	12
856 Plains Road	36.1	41.6	36.1	32.5	32.9	27.9	25.0	27.4	30.1	30.6	38.5	42.2		33.4	12
Morley Mills, Daybrook	50.4	51.3	45.8	37.2	30.4	30.1	31.4	32.0	38.4	42.6	45.2	56.8		41.0	12
Mansfield Road, Redhill	40.5	44.0	41.3	32.7	25.9	23.7	22.4	20.6	29.6	29.6	31.5	41.1		31.9	12
Daybrook Dental Surgery	45.1	48.3	42.0	37.6	32.3	29.5	31.6	31.4	39.3	41.3	47.8	52.4		39.9	12
Victoria Road, Netherfield 1	42.2	44.0	38.5	31.2	30.4	29.7	24.6	24.1	32.2	36.8	43.0	41.3		34.8	12
Victoria Road, Netherfield 2	55.8	47.6	43.6	41.5	37.4	26.7	35.5	33.4	41.9	39.9	47.2	51.1		41.8	12
47 Plains Road	48.7	40.0	39.1	33.9	27.0	25.6	26.3	24.7	30.8	40.1	39.2	41.8		34.8	12
Burton Rd/Shearing Hill	35.5	36.2	-	27.1	23.2	22.9	22.1	24.7	29.0	27.5	37.8	38.7		29.5	11
Vale PH - Thackerays Ln	49.0	49.2	47.0	41.9	36.4	35.0	22.6	37.6	42.6	39.5	48.4	48.9		41.5	12
Grove PH - Daybrook Sq	55.7	63.0	46.2	46.8	41.8	35.2	29.7	33.0	46.3	39.9	51.3	55.7		45.4	12
Ricket Lane	25.6	27.1	18.3	16.0	11.2	11.1	11.8	11.7	13.8	17.4	22.6	28.6		17.9	12
Wickes Store, Daybrook	43.2	46.0	44.8	40.2	29.8	27.0	31.1	31.5	35.4	42.3	-	51.1		38.4	11
Civic Centre, Arnold	31.7	31.6	25.1	21.4	16.4	15.5	18.1	18.2	29.5	25.6	24.7	36.5		24.5	12
Mile End Road	40.2	45.0	35.0	31.2	30.5	25.7	20.5	23.8	20.2	34.1	38.2	43.7		32.3	12
Daybrook Chip Shop	-	60.7	53.7	44.8	45.9	37.0	41.0	38.4	49.1	42.9	56.7	57.9		48.0	11
T&S Heating, Daybrook	57.5	55.3	56.2	42.0	41.9	39.4	42.0	40.1	45.7	-	55.8	67.0		49.4	11
Frank Keys, Daybrook	58.6	57.3	46.2	37.0	38.3	32.6	34.0	35.4	41.9	47.1	51.7	57.1		44.7	12

Adjusted measurement (95% confidence interval) with all the data 12 periods used in this calcuations		
Bias Factor A	0.92 (0.83 - 1.02)	
Bias B	9% (-2% - 20%)	
Tube Precision: 6	Automatic DC: 95%	
Adjusted with 95% CI	21	(19 - 23)
Adjusted with 95% CI	24	(22 - 27)
Adjusted with 95% CI	31	(28 - 34)
Adjusted with 95% CI	38	(34 - 42)
Adjusted with 95% CI	29	(26 - 33)
Adjusted with 95% CI	37	(33 - 41)
Adjusted with 95% CI	32	(29 - 36)
Adjusted with 95% CI	38	(35 - 43)
Adjusted with 95% CI	32	(29 - 35)
Adjusted with 95% CI	27	(24 - 30)
Adjusted with 95% CI	38	(34 - 42)
Adjusted with 95% CI	42	(38 - 46)
Adjusted with 95% CI	16	(15 - 18)
Adjusted with 95% CI	35	(32 - 39)
Adjusted with 95% CI	23	(20 - 25)
Adjusted with 95% CI	30	(27 - 33)
Adjusted with 95% CI	44	(40 - 49)
Adjusted with 95% CI	45	(41 - 50)
Adjusted with 95% CI	41	(37 - 46)

The bias adjustment factor used in these calculations include all the data and no screening of data due to poor precision has been applied.

2010 Diffusion Tube Results

National Diffusion Tube Bias Adjustment Factor Spreadsheet

Spreadsheet Version Number: 04/11

Follow the steps below **in the correct order** to show the results of **relevant** co-location studies

Data only apply to tubes exposed monthly and are not suitable for correcting individual short-term monitoring periods

Whenever presenting adjusted data, you should state the adjustment factor used and the version of the spreadsheet

This spreadhseet will be updated every few months: the factors may therefore be subject to change. This should not discourage their immediate use.

This spreadsheet will be updated in late June 2011 on the LAQM Helpdesk Website

The LAQM Helpdesk is operated on behalf of Defra and the Devolved Administrations by Bureau Veritas, in conjunction with contract partners AECOM and the National Physical Laboratory.

Spreadsheet maintained by the National Physical Laboratory. Original compiled by Air Quality Consultants Ltd.

Step 1:	Step 2:	Step 3:	Step 4:
Select the Laboratory that Analyses Your Tubes from the Drop-Down List	Select a Preparation Method from the Drop-Down List	Select a Year from the Drop-Down List	Where there is only one study for a chosen combination, you should use the adjustment factor shown with caution. Where there is more than one study, use the overall factor[3] shown in blue at the foot of the final column.
If a laboratory is not shown, we have no data for this laboratory.	If a preparation method is not shown, we have no data for this method at this laboratory.	If a year is not shown, we have no data[2]	If you have your own co-location study then see footnote[4]. If uncertain what to do then contact the Local Air Quality Management Helpdesk at LAQMHelpdesk@uk.bureauveritas.com or 0800 0327953

Analysed By[1]	Method (To undo your selection, choose (All) from the pop-up list)	Year[5] (To undo your selection, choose (All))	Site Type	Local Authority	Length of Study (months)	Diffusion Tube Mean Conc. (Dm) (µg/m³)	Automatic Monitor Mean Conc. (Cm) (µg/m³)	Bias (B)	Tube Precision[6]	Bias Adjustment Factor (A) (Cm/Dm)
Gradko	20% TEA in Water	2010	R	Rhondda Cynon Taf CBC	10	35	35	0.4%	G	**1.00**
Gradko	20% TEA in Water	2010	O	North Warwickshire BC	9	48	42	13.6%	P	**0.88**
Gradko	20% TEA in Water	2010	UB	LB Ealing	10	39	41	-3.8%	G	**1.04**
Gradko	20% TEA in Water	2010	R	South Norfolk Council	9	28	17	63.7%	G	**0.61**
Gradko	20% TEA in Water	2010	B	Chelmsford BC	11	16	17	-5.3%	G	**1.06**
Gradko	20% TEA in Water	2010	R	Chelmsford BC	12	33	21	55.0%	G	**0.65**
Gradko	20% TEA in Water	2010	R	Chelmsford BC	10	37	32	14.6%	G	**0.87**
Gradko	20% TEA in Water	2010	R	Wokingham BC	10	37	36	4.1%	G	**0.96**
Gradko	20% TEA in Water	2010	R	West Dunbartonshire Council	9	22	22	0.1%	G	**1.00**
Gradko	20% TEA in Water	2010	R	Scarborough BC	12	35	29	18.2%	G	**0.85**
Gradko	20% TEA in Water	2010	UB	Sandwell MBC	11	31	28	11.4%	na	**0.90**
Gradko	20% TEA in Water	2010	R	Sandwell MBC	11	45	45	-0.9%	na	**1.01**
Gradko	20% TEA in Water	2010	R	Sandwell MBC	11	37	36	2.0%	na	**0.98**
Gradko	20% TEA in Water	2010	UB	Sandwell MBC	10	22	21	8.1%	na	**0.93**
Gradko	20% TEA in Water	2010		**Overall Factor[3] (39 studies)**				**Use**		**0.92**

Gradko 20%TEA in Water Co-location Studies 2010

This calculator allows you to predict the annual mean NO_2 concentration for a location ("receptor") that is close to a monitoring site, but nearer or further the kerb than the monitor. The next sheet shows your results on a graph.

Air Quality Consultants

Enter data into the yellow cells

Step 1	How far from the KERB was your measurement made (in metres)?	(Note 1)	3.5	metres
Step 2	How far from the KERB is your receptor (in metres)?	(Note 1)	14	metres
Step 4	What is the local annual mean background NO_2 concentration (in $\mu g/m^3$)?	(Note 2)	19.73	$\mu g/m^3$
Step 3	What is your measured annual mean NO_2 concentration (in $\mu g/m^3$)?	(Note 2)	38	$\mu g/m^3$
Result	The predicted annual mean NO_2 concentration (in $\mu g/m^3$) at your receptor	(Note 3)	31.2	$\mu g/m^3$

Note 1: This should be measured horizontally from the kerb and assumes that the monitor and receptor have similar elevations. Each distance should be greater than 0.1m and less than 50m (In practice, using a value of 0.1m when the monitor is closer to the kerb than this is likely to be reasonable). The receptor is the location for which you wish to make your prediction. The monitor can either be closer to the kerb than the receptor, or further from the kerb than the receptor. The closer the monitor and the receptor are to each other, the more reliable the prediction will be. When your receptor is further from the kerb than your monitor, it is recommended that the receptor and monitor should be within 20m of each other. When your receptor is closer to the kerb than your monitor, it is recommended that the receptor and monitor should be within 10m of each other.

Note 2: The measurement and the background must be for the same year. The background concentration could come from the national maps published at www.airquality.co.uk, or alternatively from a nearby monitor in a background location.

Note 3: The calculator follows the procedure set out in Box 2.2 of LAQM TG(08). The results will have a greater uncertainty than the measured data. More confidence can be placed in results where the distance between the monitor and the receptor is small than where it is large.

Issue 1: 30/06/08. Created by Dr Ben Marner; Approved by Prof Duncan Laxen. Contact: benmarner@aqconsultants.co.uk

Vale PH Calculation for Distance to Receptor

This calculator allows you to predict the annual mean NO_2 concentration for a location ("receptor") that is close to a monitoring site, but nearer or further the kerb than the monitor. The next sheet shows your results on a graph.

Air Quality Consultants

Enter data into the yellow cells

Step 1	How far from the KERB was your measurement made (in metres)?	(Note 1)	1.5	metres
Step 2	How far from the KERB is your receptor (in metres)?	(Note 1)	4.5	metres
Step 4	What is the local annual mean background NO_2 concentration (in $\mu g/m^3$)?	(Note 2)	18.49	$\mu g/m^3$
Step 3	What is your measured annual mean NO_2 concentration (in $\mu g/m^3$)?	(Note 2)	38	$\mu g/m^3$
Result	The predicted annual mean NO_2 concentration (in $\mu g/m^3$) at your receptor	(Note 3)	33.3	$\mu g/m^3$

Note 1: This should be measured horizontally from the kerb and assumes that the monitor and receptor have similar elevations. Each distance should be greater than 0.1m and less than 50m (In practice, using a value of 0.1m when the monitor is closer to the kerb than this is likely to be reasonable). The receptor is the location for which you wish to make your prediction. The monitor can either be closer to the kerb than the receptor, or further from the kerb than the receptor. The closer the monitor and the receptor are to each other, the more reliable the prediction will be. When your receptor is further from the kerb than your monitor, it is recommended that the receptor and monitor should be within 20m of each other. When your receptor is closer to the kerb than your monitor, it is recommended that the receptor and monitor should be within 10m of each other.

Note 2: The measurement and the background must be for the same year. The background concentration could come from the national maps published at www.airquality.co.uk, or alternatively from a nearby monitor in a background location.

Note 3: The calculator follows the procedure set out in Box 2.2 of LAQM TG(08). The results will have a greater uncertainty than the measured data. More confidence can be placed in results where the distance between the monitor and the receptor is small than where it is large.

Issue 1: 30/06/08. Created by Dr Ben Marner; Approved by Prof Duncan Laxen. Contact: benmarner@aqconsultants.co.uk

36 Victoria Road Calculation for Distance to Receptor

Site	NO2 /ugm-3 2010 jan	feb	mar	apr	may	jun	jul	aug	sep	oct	nov	dec	Annual Mean	Adjusted for bias	Distance Adjmnt	Data Capture
Marion Murdock Court	34	31	24	21	15	14	14	14	19	25	27	35	23	21		100
Hastings Street	39	37	32	27	19	15	17	17	21	26	30	38	26	24		100
856 Plains Road	36	42	36	32	33	28	25	27	30	31	38	42	33	31		100
Morley Mills, Daybrook	50	51	46	37	30	30	31	32	38	43	45	57	41	38		100
Mansfield Road, Redhill	41	44	41	33	26	24	22	21	30	30	31	41	32	29		100
Daybrook Dental Surgery	45	48	42	38	32	29	32	31	39	41	48	52	40	37		100
19 Victoria Road, Netherfield	42	44	38	31	30	30	25	24	32	37	43	41	35	32		100
36 Victoria Road, Netherfield	56	48	44	42	37	27	35	33	42	40	47	51	42	38	31	100
47 Plains Road	49	40	39	34	27	26	26	25	31	40	39	42	35	32		100
Burton Rd/Shearing Hill	35	36	-	27	23	23	22	25	29	27	38	39	30	27		92
The Vale PH - Thackerays Ln	49	49	47	42	36	35	23	38	43	40	48	49	42	38	33	100
The Grove PH - Daybrook Sq	56	63	46	47	42	35	30	33	46	40	51	56	45	42		100
Ricket Lane	26	27	18	16	11	11	12	12	14	17	23	29	18	16		100
Wickes Store, Daybrook	43	46	45	40	30	27	31	32	35	42	-	51	38	35		92
Civic Centre, Arnold	32	32	25	21	16	16	18	18	30	26	25	37	25	23		100
Mile End Road	40	45	35	31	30	26	20	24	20	34	38	44	32	30		100
Daybrook Chip Shop	-	61	54	45	46	37	41	38	49	43	57	58	48	44		92
T&S Heating, Daybrook	58	55	56	42	42	39	42	40	46	-	56	67	49	45		92
Frank Keys, Daybrook	59	57	46	37	38	33	34	35	42	47	52	57	45	41		100
Analyser in ppb	25	29	23	21	17	15	11	12	15	20	26	31	20			
ANALYSER IN ug/m-3	**48**	**55**	**44**	**40**	**33**	**29**	**21**	**22**	**30**	**38**	**49**	**60**	**39**			
DATA CAPTURE %	97	97	97	97	92	75	97	97	95	97	96	97	95	%		

Bias Adjustment Factors (BAF)	gradko	0.92	39 National (various)

Nitrogen Dioxide Diffusion Tube Monitoring 2010 - Adjusted for Bias

Appendix C

QA / QC Data

Quality Assurance and Quality Control – Nitrogen Dioxide Diffusion Tubes

Overview

Diffusion tubes are small clear plastic tubes open at one end with a pollutant-absorbing chemical matrix or gel at the closed end. The tubes are prepared and sealed before being transported to the monitoring site. At site, the tube is exposed, by removal of the end cap, for a period of one month. After the month the tube is resealed and sent to an analytical laboratory.

The laboratory analysis measures the quantity of pollutant absorbed and then calculates an average ambient pollutant concentration over the exposure period. Diffusion tube results are for NO_2, concentrations measured in parts per billion (ppb) and micrograms per cubic metre (μgm^3).

Tubes are exposed on a monthly basis, following the timetable prescribed by the Diffusion Tube Network in which tubes are replaced generally on the first Wednesday of the month.

Historical, Walsall Metropolitan Borough Council Laboratory have supplied and analysed GBC NO_2 diffusion tubes, using 50% solution TEA in acetone.

From April 2008 GBC entered into a Countywide contract with Gradko Ltd. for the supply and analysis of NO_2 diffusion tubes. At the same time it was agreed to use the same preparation method (20% solution of TEA in water). This harmonisation of laboratory and method for the county will allow easier comparisons of results across LA boundaries.

QA/QC Procedures

<u>Gradko</u>
The European Union Daughter Directive for NO_2 sets out data quality objectives for overall accuracy. Annual average NO_2 concentration results must comply with the objective of $\pm$25% of the reference concentration therefore, average diffusion tube measurements should comply with this objective.

The precision of analytical measurements is also an important consideration, as it is possible to arrive at an average bias of less than $\pm$25% with very imprecise measurements. Following previous intercomparisons of laboratory results an arbitrary guideline figure of 3ppb for acceptable precision has been adopted.

Gradko's NO_2 diffusion tube procedures follow the Defra guideline document[1] related to the preparation, extraction, analysis and calculation procedures for NO_2 passive diffusion tubes. Their internal analysis procedures are assessed by U.K.A.S. on an annual basis for compliance to ISO17025.

Results from the ongoing Workplace Analysis Scheme for Proficiency (WASP) programme for Gradko generally show a "Satisfactory" performance classification.

[1] Diffusion Tubes for Ambient NO_2 Monitoring: Practical Guidance for Laboratories and Users

Gedling Borough Council

Tubes are stored in a refrigerator until the day of exposure. On site, when the tubes are collected the date, site and time are recorded, referenced to the tube numbers assigned by the laboratory. The tubes are then forwarded to Gradko for analysis on the day of collection, along with a 'blank' trip diffusion tube.

The Council has conducted a co-location study, details are found in Appendix B.

Quality Assurance and Quality Control – BTex Diffusion Tubes

The tubes used are Perkin Elmer thermal desorption (ATD) tubes packed, with nominally 100mg of Chromosorb 106. They are analysed using a Perkin Elmer ATD 400 automatic thermal system; Perkin Elmer 8700 gas chromatography with an ion trap detector. The uptake rate for benzene onto Chromosorb 106 is 0.54cm3 /min. Tubes were analysed by Walsall Metropolitan Borough Council Laboratory (WMBCL) from 1997 until 2003. However, WMBCL were unable to continue processing Btex tubes and so Harwell Scientifics took over with supply and analysis from April 2003.

Tubes are stored in a refrigerator until the day of exposure. On site, when the tubes are collected the date, site and time are recorded, referenced to the tube numbers assigned by the laboratory. The tubes are then forwarded to Scientific Ltd for analysis on the day of collection.

Tubes are exposed on a monthly basis, following the timetable prescribed by NETCEN in which tubes are replaced generally on the first Wednesday of the month.

Chemiluminescent Monitor Data

Overview

The automatic monitoring system used (Monitor Labs ML®9841B) uses gas-phase chemiluminescence detection to perform continuous analysis of nitric oxide (NO), total oxides of nitrogen (NOx), and nitrogen dioxide (NO_2). The instrument consists of a pneumatic system, an NO_2-to-NO converter (molycon), a reaction cell, photomultiplier tube (PMT) detector, and processing electronics.

During 2001-2007 the analyser was housed in the basement of the Daybrook Baptist Chapel. This site provides a safe and secure, dry location with a constant temperature and electrical supply. In January of 2008 the analyser was moved to a Casella ROMON enclosure on the opposite side of the A60 Mansfield Road.
The analyser has been operational since August 2000; data capture levels are: -

96% 2001	96% 2005	95% 2009
95% 2002	93% 2006	95% 2010
97% 2003	83% 2007	
98% 2004	81% 2008	

The ML®9841B analyser has a quoted detection of ± 0.5ppb and a precision of ± 0.5ppb or 1% of reading, which ever is largest. Accuracy of the analyser is dependent on the calibration and the calibration gases used.

QA/QC Procedures

The analyser is subject to a fortnightly two point manual calibration, by a suitably trained site operative, which is conducted in accordance with the manufacturers quality control procedures. Filters at the sample head are changed concurrently with calibration. The equipment is serviced twice a year by the manufacturers accredited engineers. In addition the National Physical Laboratory (NPL) audited the site in 2002 and 2005.

Calibration gases (Air and NO) used during the fortnightly calibration are supplied by BOC, who have demonstrated compliance with relevant quality control procedures in the preparation of gas mixtures. Gas cylinders are replaced before use by dates or when the gas levels fall below 50 bar.

Data Validation and Ratification

A process of data validation is carried out by GBC on a fortnightly basis after application of the calibration factors. Validation is carried out in accordance with good practise [Annex 1.164 of LAQM TG(09)].

Then every quarter the data undergoes a process of ratification; assessing for drift, removing spurious data etc. Again this process is carried out in accordance with good practice [Annex 1.164 of LAQM TG(09)].