



Detailed Assessment of Air Quality – August 2010

Newbury Road (A339),
Basingstoke & Deane
Borough Council



*Basingstoke
and Deane*

**Report to Basingstoke and Deane Borough
Council**

ED47995001

Issue 1

August 2010

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Executive summary

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.

This report is a Detailed Assessment of Air Quality for the area of Newbury Road outside The Old Plough, near the junction with Ashford Hill Road, and Beech House, near the junction with Knightsbridge Drive. Relevant exposure at the site is believed to exist at the façades of The Old Plough and Beech House, as the buildings serve as residential properties. Monitoring of NO₂ by use of a diffusion tube on a lamppost outside the Old Plough has been operated since April 2008. Additional monitoring was commenced in December 2009 outside, and at the façade of, Beech House, on a bus stop outside the Old Plough and, in triplicate, at the façade of The Old Plough.

The 2008 Updating and Screening Assessment identified possible exceedences of the Air Quality Strategy (AQS) objectives for NO₂ from monitoring results at site 15, located on a lamppost outside The Old Plough. It was therefore concluded that a Detailed Assessment of NO₂ in the area was necessary and additional monitoring was recommended in the area; this Assessment fulfils this requirement and considers the new monitoring data from diffusion tubes located at sites along Newbury Road. The Review and Assessment helpdesk suggested that the Detailed Assessment could be based on monitoring data and this has informed the scope of the work.

Monitoring data from site 15 for 2008 to 2010, and from sites 23 to 28 for seven intervals in 2010, have been considered in this assessment. Data from new monitoring locations at Beech House and The Old Plough indicated concentrations of NO₂ significantly below the AQS annual mean objective limit at locations of relevant exposure. Although kerbside monitoring at The Old Plough indicated NO₂ concentrations above the objective limit, the sites were found to have no relevant exposure and it is therefore concluded that there is currently no need to declare an AQMA for NO₂ in the area. It is however recommended that Basingstoke and Deane Borough Council should continue, and possibly expand, monitoring of NO₂ at locations of relevant exposure in the area.

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1 Introduction

1.1 Project background

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.

DEFRA have indicated a requirement for Basingstoke and Deane Borough Council to submit a Detailed Assessment of Air Quality in the locale of The Old Plough, located alongside the A339 near the junction with Ashford Hill Road. Additional monitoring data has been collected, by use of diffusion tubes at the site, to better understand the scale of any exceedences of the NO₂ annual mean objective in the area.

The purpose of this Detailed Assessment is to allow Basingstoke and Deane Borough Council to assess the likelihood and spatial extent of exceedences of NO₂. The findings of this Detailed Assessment will allow Basingstoke and Deane Borough Council to decide if it is necessary to declare an Air Quality Management Area (AQMA) or not. If exceedences of air quality objectives are predicted in this assessment, the Council will be required to complete a Further Assessment of Air Quality to support development of the AQAP.

1.2 Policy context

1.2.1 Air Quality Strategy (AQS) and Objectives

The latest AQS was published in 2007 and presents a framework for management of ambient air quality in the UK. The Strategy provides a set of air quality objectives for a number of pollutants which are broadly aligned with European Directives. The Strategy sets out a number of UK wide policy interventions which have potential to improve ambient air quality across the whole country.

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 $\mu\text{g}/\text{m}^3$ with the number of exceedences in each year that are permitted (where applicable).

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	
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

1.2.1 Local Air Quality Management

The Local Air Quality Management (LAQM) system was introduced by the Environment Act 1995 and the Environment (Northern Ireland) Order 2002. A duty was placed on local authorities to periodically review and assess the current, and likely future, air quality in their areas against national air quality objectives for seven air pollutants included in regulations. Where any objective is unlikely to be met by the relevant deadline, local

authorities must designate those areas as air quality management areas (AQMAs) and take action, along with others, to work towards meeting the objectives.

The review and assessment process is arranged in a series of rounds each covering a three year period. Local Authorities have now completed three rounds, with the fourth covering 2009-2012.

The UK Government has provided Technical and Policy Guidance to help Local Authorities fulfil their LAQM obligations. The latest version of these guidance documents were published in 2009 and underpin the methodology and format of this report.

1.3 Summary of previous review and assessments

Basingstoke and Deane Borough Council have made a number of Air Quality Review and Assessment reports available on their website, the earliest being the Stage 3 Review and Assessment published in 2000. The conclusions and implications of all completed Air Quality Review and Assessment reports to date are outlined below.

1.3.1 First Round of Review and Assessment

Basingstoke and Deane Borough Council completed all stages of the first round of Review and Assessment by 2000, concluding that the Air Quality Strategy objectives were likely to be met for all pollutants by the required dates.

1.3.2 Second Round of Review and Assessment

Air Quality Updating and Screening Assessment (USA), 2003

The assessment carried out by Basingstoke and Deane Borough Council in 2003 concluded that, since no exceedences of the Air Quality Strategy objectives were predicted at locations of relevant exposure in the borough, a Detailed Assessment was not required.

Progress Report, 2004

By considering diffusion tube monitoring data from sites in the borough, a potential exceedence of the annual mean objective for nitrogen dioxide was identified at the Winchester Street junction with Winton Square. A Detailed Assessment was therefore deemed to be required, considering concentrations of NO₂ at locations of relevant exposure in the vicinity of the junction. As a precursor to this assessment, additional diffusion tube monitoring was undertaken at four locations from May 2004.

Detailed Assessment, 2005

The assessment of concentrations of NO₂ around the Winchester Street junction with Winton Square concluded that, since the use of a flat above a restaurant in the area did not constitute relevant public exposure, and AQMA was not required. It was however recommended that additional monitoring of nitrogen dioxide be implemented in the area. Monitoring by use of diffusion tubes was subsequently implemented at seven additional sites close to Winton Square.

1.3.3 Third Round of Review and Assessment

Air Quality Updating and Screening Assessment (USA), 2006

The third round Updating and Screening Assessment, completed in June 2006, identified likely exceedences of the Air Quality Strategy annual mean objective for NO₂ from the additional monitoring implemented in December 2005. It was concluded that there was potential exposure to this exceedence at the location noted the 2004 Progress Report, and considered in the 2005 Detailed Assessment, but it was not concluded that exposure at the site (used as a staff rest room) constituted relevant public exposure. No significant changes likely to affect emissions of carbon monoxide, benzene, 1,3-butadiene, lead, sulphur dioxide or PM₁₀ were noted, and it was therefore concluded that exceedences of the Air Quality Strategy objectives for these pollutants was not likely and there was no requirement to proceed to a Detailed Assessment.

Progress Report, 2007

In July 2007 Basingstoke and Deane Borough Council produced a Progress Report considering NO₂ monitoring data from 22 sites, concluding that there were no likely exceedences at locations of relevant exposure in the borough.

Progress report, 2008

The final Stage 3 Progress Report, published in April 2008, concluded from NO₂ monitoring at 20 sites that there were no likely exceedences of the Air Quality Strategy objective at locations with relevant exposure. It was noted that several new housing developments were underway in the borough, but Basingstoke and Deane Borough Council were not required to conduct a Detail Assessment for any of the pollutants covered by the Air Quality Strategy.

1.3.4 Fourth round of Review and Assessment**Air Quality Updating and Screening Assessment (USA), 2008**

Monitoring data from eight diffusion tube sites in the district recorded annual mean NO₂ concentrations exceeding the Air Quality Strategy objective. Seven of these sites are located in the vicinity of Winton Square, and have therefore been considered in the 2005 Detailed Assessment, however data from site 15 indicated possible exceedences at locations of relevant exposure at The Old Plough on Newbury Road near Headley. Concentrations of NO₂ at the roadside façade of the building were estimated to be 45 µg·m⁻³. Since The Old Plough is a residential property, it was therefore recommended that Basingstoke and Deane Borough Council proceed to a Detailed Assessment of NO₂ in the vicinity of site 15. It was also recommended that Basingstoke and Deane Borough Council increase the number of diffusion tube monitoring sites along Newbury Road (A339), Headley, Thatcham and deploy them at several sites in the vicinity of site 15, the Old Plough.

As a result of these recommendations, AEA have been commissioned by Basingstoke and Deane Borough Council to undertake a Detailed Assessment of Air Quality in the locale of The Old Plough, located alongside the A339 near the junction with Ashford Hill Road, in accordance with the requirements of the Environment Act 1995.

1.4 Scope of this Detailed Assessment

LAQM.TG(09) sets out the objective and recommended approach to carrying out a Detailed Assessment:

- **Objective-** to provide an accurate assessment of the likelihood of an air quality objective being exceeded at locations with relevant exposure. This should be sufficiently detailed to allow the designation of any necessary AQMAs.
- **Approach-** use quality assured monitoring data and validated modelling methods to determine current and future pollutant concentrations in areas where there is a significant risk of exceeding an air quality objective.

The assessment should focus on locations where members of the public are likely to be exposed over the averaging period of the objective. In practice this means that the annual mean objectives tend to apply at residential locations, while shorter term objectives (for instance 1hr and 24hr) apply at a much wider range of locations.

This Detailed Assessment is focused on an area on Newbury Road near the junction with Ashford Hill Road where there are potential exceedences of NO₂ associated with emissions from local road transportation. The assessment utilises monitoring data provided by the Council for the period 2008 to 2010. The likelihood of any exceedences of NO₂ are provided and where appropriate, the spatial extent of these are estimated. The procedures and methodologies outlined in LAQM.TG(09) have been used and reference as appropriate throughout.

2 Supporting data

This Detailed Assessment utilises data from non-automatic monitoring data from 2008 to 2010 supplied by Basingstoke and Deane Borough Council, and automatic monitoring data from the AURN.

2.1 New monitoring data

2.1.1 Automatic monitoring data

Basingstoke and Deane Borough Council do not operate automatic monitoring of any kind within the borough. The closest AURN site, with continuous NO₂ data from 2009, to the exceedences noted at The Old Plough is located at the Harwell business park, and this has therefore been used where annualisation of data is necessary.

2.1.2 Non-automatic monitoring data

Basingstoke and Deane Borough Council operate non-automatic monitoring of NO₂ at 29 sites, six of which were first set-up in December 2009. Data recorded from sites in January 2010 represented the two preceding months as no data was collected at the end of December 2009, this data has therefore been used to represent both December 2009 and January 2010 monthly mean NO₂ concentrations. Complete site information is not currently available for the six new sites, and where necessary, distances to relevant exposure have therefore been estimated conservatively from photographs. In such cases where the LAQM.TG(09) 'Nitrogen Dioxide Fall off with Distance' methodology has been used, it should be noted that the calculation do not account for environmental factors, and are may therefore be notably less accurate than monitoring at relevant receptors.

Table 2.1 – Details of Non- Automatic Monitoring Sites

Site Name	Site Type	OS Grid Ref	Pollutants Monitored	In AQMA?	Relevant Exposure? (Y/N with distance (m) to relevant exposure)	Distance to kerb of nearest road (N/A if not applicable)	Worst-case Location ?
1. Winton Square, Basingstoke	R	463600 151800	NO ₂	N	N	1.7	Y
2. Winchester Rd., Basingstoke	R	462300 150700	NO ₂	N	N	2.3	Y
3. Lambs Row, Lychpit	UB	465600 153300	NO ₂	N	N	1.5	N
4. Stocker Close, Basingstoke	UB	463500 150700	NO ₂	N	N	1.6	N
5. Four Lane School, Hanmore Road	UB	465811 155467	NO ₂	N	Y	5.0	N
6. Adjacent to Forge Farm, Newbury Rd	R	451228 162862	NO ₂	N	N	1.4	N
7. Front façade, The Guru (restaurant)	UB	451721 162462	NO ₂	N	Y	1.2	N
8. Front façade, Star Inn, Newbury Rd, Kingsclere	R	451712 159779	NO ₂	N	Y	3.6	N
9. Traffic Lights @Winton Square	R	463640 151857	NO ₂	N	N	1.4	Y
10. Corner of New St./Winton Square jct	R	463586 151862	NO ₂	N	N	1.1	Y
11. Corner of Winton Square/Sarum Hill jct.	R	463586 151862	NO ₂	N	N	1.6	Y
12. Outside 4 Winton Square	R	463607 151840	NO ₂	N	N	0.9	Y
13. Adjacent to 52 New Rd, Basingstoke	R	463982 152014	NO ₂	N	Y	4.8	Y
14. Adjacent Summersby, Newtown Common	R	447294 163593	NO ₂	N	N	5.0	Y
15. Outside the Old Plough, Newbury Rd	R	451377 162725	NO ₂	N	N	1.8	Y
16. Jct. Winton Sq/Winchester Rd	R	463587 151845	NO ₂	N	N	1.1.	Y
17. Outside 37 Winchester St	R	463662 151852	NO ₂	N	N	0.4	Y
18. Adjacent to 37 Winchester St	R	463664 151836	NO ₂	N	N	1.7	Y
19. Adj. Copenhagen House. New St.	R	463658 151912	NO ₂	N	N	0.5	Y
20. Outside 45 Winchester St.	R	463625 151846	NO ₂	N	N	0.5	Y
21. Jct. Winton Sq/Winchester St	R	463586 151830	NO ₂	N	N	0.6	Y
22. Façade of Agra Balti, 34 Winchester St.	R	463636 151856	NO ₂	N	N	1.3	Y
23. Front façade, Beech House, Newbury Road	R	-	NO ₂	N	Y	14.7	N
24. Front façade, The Old Plough (1)	R	-	NO ₂	N	Y	5.5	Y
25. Front façade, The Old Plough (1)	R	-	NO ₂	N	Y	5.5	Y
26. Front façade, The Old Plough (1)	R	-	NO ₂	N	Y	5.5	Y
27. Bus stop o/s The Old Plough	R	-	NO ₂	N	N	2.0	Y
28. O/s Beech House, Newbury Road	R	-	NO ₂	N	N	2.0	Y

Table 2.2 – Results of Nitrogen Dioxide Diffusion Tube site 15

	2008	2009	2010
Raw mean ($\mu\text{g}\cdot\text{m}^{-3}$)	63.7	68.4	66.2
Bias adjustment factor	0.82	0.81	0.81 (<i>from 2009</i>)
Bias adjusted result ($\mu\text{g}\cdot\text{m}^{-3}$)	52.2	55.4	53.6
Data capture (% of full year)	75%	83%	58%
Annualised result ($\mu\text{g}\cdot\text{m}^{-3}$)	58.0	55.6	56.1
Kerbside adjusted ($\mu\text{g}\cdot\text{m}^{-3}$)	49.3	47.1	47.4

Results from site 15 (Table 2.2) have been bias adjusted using information from the AQ R&A helpdesk database of bias adjustment factors, as no data is available for 2010, the 2009 factor has been used for this data. To compensate for the poor data capture in all years, data has been annualised using information from the Harwell AURN site; although there is a closer site in Reading no data after July 2009 is currently available. 2010 annualisation has been calculated as a best estimate, using AURN data from 2009 and January to August 2010, to represent the full calendar year 2010.

The diffusion tube at site 15 is not positioned at a location of relevant exposure, but on a nearby lamp post. Data collected from the site has therefore been adjusted, using the 'Nitrogen Dioxide Fall off with Distance' methodology outlined in LAQM.TG(09), to represent the NO₂ concentration at the building façade, which assumed to be at least 4.1 m from the road. However, the effect of the fence surrounding the property of The Old Plough has not been accounted for in these calculations, and the resultant NO₂ concentrations are likely to be overestimates.

Table 2.3 – 2009/10 Results of Nitrogen Dioxide Diffusion Tube sites 15, 24, 25, 26 and 27 / $\mu\text{g}\cdot\text{m}^{-3}$

Site ID	Raw mean (Aug '09 – Jul '10)	Bias adjusted (BA factor = 0.81)	Annualised (Aug '09 – Jul '10)	Kerbside adjusted
15. Outside The Old Plough	66.2	53.6	50.7	43.1
24. The Old Plough façade 1	41.4	33.6	29.8	-
25. The Old Plough façade 2	42.1	34.1	30.3	-
26. The Old Plough façade 3	41.5	33.6	29.9	-
27. The Old Plough bus stop	70.0	56.7	50.4	43.6

The limited results from the triplicate co-location study at the front façade of The Old Plough (Table 2.3 – sites 24, 25 and 26) indicate, with a good precision of results (Appendix 1 – Fig. A2), that NO₂ concentrations at the façade of The Old Plough are around 30 $\mu\text{g}\cdot\text{m}^{-3}$. This is well below the AQS annual mean objective for NO₂, and indicates that the objective is not exceeded at locations of relevant exposure.

Results from site 27 show fairly good consistency with those from site 15 in the same period, and indicate that concentrations of NO₂ at the kerbside outside The Old Plough in the annualised period were above 50 $\mu\text{g}\cdot\text{m}^{-3}$. Application of the kerbside adjustment methodology consequently predicts similar results as from the site 15 data, of around 43 $\mu\text{g}\cdot\text{m}^{-3}$. As noted previously, this is likely to be an over-estimate of NO₂ concentrations at locations relevant exposure near the site.

Data from the kerbside diffusion tube sites near The Old Plough indicate that the AQS annual mean objectives for NO₂ have been exceeded at locations of relevant exposure near The Old Plough on Newbury Road. However, measurements at the façade of The Old Plough suggest that NO₂ concentrations at such locations are significantly lower than suggested by the 'kerbside adjustment' methodology. Due to the good precision of the tubes' results, and the significant margin by which measured NO₂ is below the objective limit, it may therefore be concluded with some certainty that the annual mean objective for NO₂ is not exceeded at locations of relevant exposure in the vicinity of The Old Plough. However NO₂ monitoring should be continued, and possibly expanded, to confirm this conclusion.

Table 2.4 – Results of Nitrogen Dioxide Diffusion Tube sites 23 and 28

Site ID	Raw mean (Dec '09 – Jul '10)	Bias adjusted (BA factor = 0.81)	Annualised (Aug '09 – Jul '10)	Kerbside adjusted
23. Beech House façade	27.6	22.4	19.9	-
28. Outside Beech House	66.9	54.2	48.2	28.6

Results from the Beech House diffusion tubes (sites 23 and 28) do not indicate exceedences of the AQS objectives (Table 2.4) at locations of relevant exposure, which are assumed to be at least 18 metres from the kerb. However recorded kerbside NO₂ concentrations at site 28 are in good agreement with those from other kerbside sites on Newbury Road (sites 15 and 27), and therefore verify the earlier conclusion that kerbside NO₂ on Newbury Road is around 50 µg·m⁻³.

2.1.3 Conclusions drawn from new monitoring data

Concentrations of NO₂ at kerbside sites along Newbury Road in the vicinity of Beech House and The Old Plough exceed the AQS annual mean objective for NO₂ by a significant margin, however these results are not representative of relevant exposure. Measured concentrations at locations of relevant exposure, on the façades of both buildings, fall well below the objective limit.

It may therefore be concluded that **the AQS annual mean objective for NO₂ has not been exceeded at locations of relevant exposure close to Newbury Road in the vicinity of Beech House and The Old Plough.** However it is recommended that monitoring should be continued, and possibly expanded, at locations of relevant exposure in the vicinity of The Old Plough.

Appendices

Appendix 1: QA:QC Data

Appendix 2: Annualisation procedure

Appendix 1

QA:QA Data

Diffusion Tube Bias Adjustment Factors

Diffusion tubes may systematically under or over-read NO₂ concentrations when compared to the reference chemiluminescence analyser. This is described as bias and can be corrected for to improve the accuracy of the diffusion tube results, using a suitable bias adjustment factor.

Basingstoke and Deane Borough Council's diffusion tubes are prepared and analysed by Bureau Veritas (formerly known as Casella SEAL) using the 10% TEA in water method. This laboratory takes part in the QA/QC Field Intercomparison, operated on behalf of Defra as part of their Support to Local Authorities for LAQM contract.

As no automatic monitoring was undertaken in the Basingstoke and Deane Borough during 2009, the bias adjustment factors used within this Detailed Assessment were derived from the national database of collocation studies (<http://www.uwe.ac.uk/aqm/review/R&Asupport/diffusiontube310310.xls>) as shown in Figure A1. Footnotes in this spreadsheet state 'For [...]Bureau Veritas Labs[...] use Environmental Scientific Groups', which laboratory has reported only results using 20% TEA in water in 2009. Results from this spreadsheet using this method provided a national bias adjustment factor of 0.81 which has therefore been used for 2009 and 2010 results in this report. 2008 results have been adjusted using the bias adjustment factor used in the 2008 Updating and Screening Assessment (0.82).

Figure A1 – Diffusion Tube Bias Adjustment Calculations

Follow the steps below in the correct order to show the results of relevant co-location studies										Spreadsheet Version Number: 03/10	
Data only apply to tubes exposed monthly and are not suitable for correcting individual short-term monitoring periods										This spreadsheet will be updated in late September 2010 on the	
Whenever presenting adjusted data, you should state the adjustment factor used										R&A website	
This spreadsheet will be updated every few months: the factors may therefore be subject to change. This should not discourage their immediate use.										Published by Air Quality Consultants Ltd on behalf of Defra, the Welsh Assembly Government, the Scottish Government and the Department of the Environment Northern Ireland	
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.		If you have your own co-location study then see footnote ⁴ . If uncertain what to do then contact the Review and Assessment Helpdesk 0117 323 3068 aqm-review@uwe.ac.uk.				
Analysed By	Method	Year	Site Type	Local Authority	Length of Study (months)	Diffusion Tube Mean Conc. (Dm) (µg/m ³)	Automatic Monitor Mean Conc. (Cm) (µg/m ³)	Bias (B)	Tube Precision ⁵	Bias Adjustment Factor (A) (Cm/Dm)	
Environmental Scientific Groups	20% TEA in Water	2009	S	Chichester DC	11	44	34	30.2%	G	0.77	
Environmental Scientific Groups	20% TEA in Water	2009	R	Castlereagh BC	12	49	39	23.7%	G	0.81	
Environmental Scientific Groups	20% TEA in Water	2009	R	Castlereagh BC	12	31	25	27.4%	G	0.79	
Environmental Scientific Groups	20% TEA in Water	2009	R	Lisburn CC	12	32	28	21.2%	P	0.83	
Environmental Scientific Groups	20% TEA in Water	2009	R	North Down BC	12	49	38	38.3%	G	0.73	
Environmental Scientific Groups	20% TEA in Water	2009	R	Wrexham CBC	11	26	23	13.4%	G	0.88	
Environmental Scientific Groups	20% TEA in Water	2009	R	Horsham DC	10	36	32	13.4%	G	0.88	
Environmental Scientific Groups	20% TEA in Water	2009	K	AEA Tech Intercomparison	12	132	107	22.0%	G	0.81	
Environmental Scientific Groups	20% TEA in Water	2009			Overall Factor ³ (8 studies)				Use	0.81	

QA/QC of diffusion tube monitoring

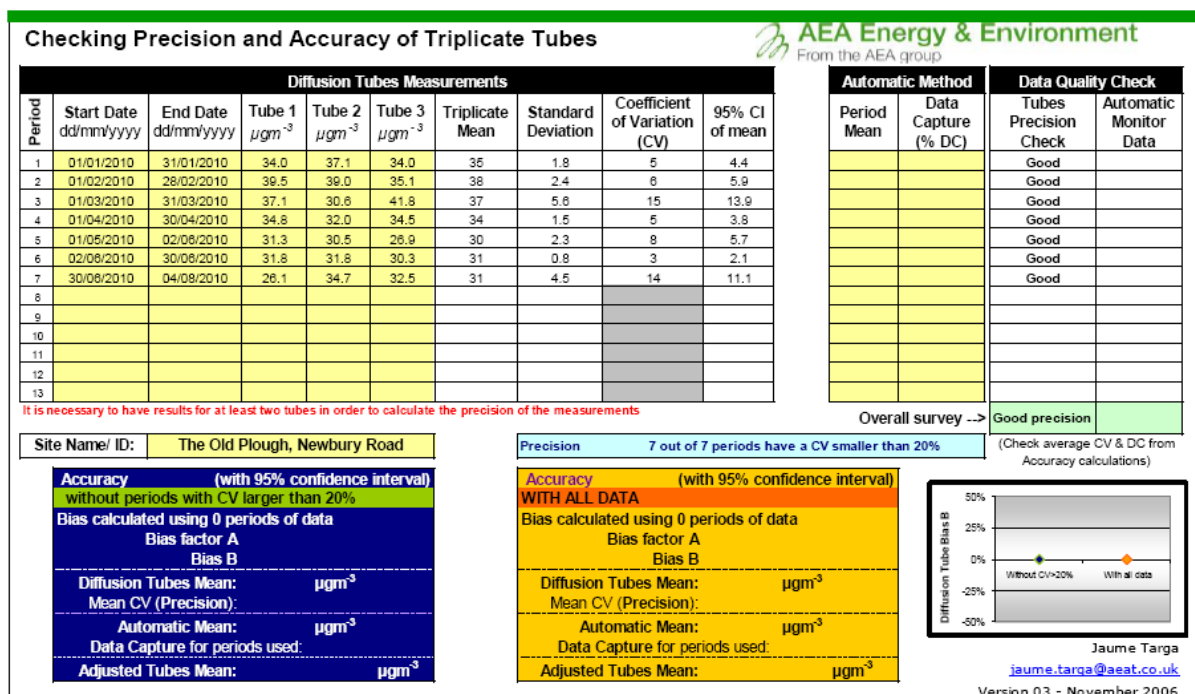
The Workplace Analysis Scheme for Proficiency (WASP) is an independent analytical performance-testing scheme, operated by the Health and Safety Laboratory (HSL). WASP formed a key part of the former UK NO₂ Network's QA/QC, and remains an important QA/QC exercise for laboratories supplying diffusion tubes to Local Authorities for use in the context of Local Air Quality Management (LAQM). The laboratory participants analyse four spiked tubes, and report the results to HSL. HSL assign a performance score to each laboratory's result, based on their deviation from the known mass of nitrite in the analyte.

The outcomes of these QA/QC schemes are evaluated on a regular basis against a set of pre-defined performance criteria. The Performance criteria are due to be changed at present the criteria are based on the

z-score method, however from April 2009, the criteria will be based upon the Rolling Performance Index (RPI) statistic. Bureau Veritas (formerly known as Casella SEAL) takes part in the independent Workplace Analysis Scheme for Proficiency. The WASP – Annual Performance Criteria for NO₂ Diffusion Tubes used in Local Air Quality Management (LAQM), Summary of Laboratory Performance in 2008 and 2009 indicates that Environmental Scientific Groups demonstrated ‘Good’ performance in 11 of 15 studies (73%) in 2008 and 7 of 8 studies (88%) in 2009, with the remainder demonstrating ‘Poor’ performance.

Diffusion tubes are located in triplicate on the façade of The Old Plough, Newbury Road, allowing for an assessment of the precision of results from this site. This has been calculated in accordance with LAQM.TG(09) guidance using the Precision and Accuracy Spreadsheet Tool (AEA_DifTAPB_v03.xls) available from the LAQM Support Pages provided by Defra and the Devolved Administrations. These calculations indicate (see Figure A2) that results from the triplicate co-location study show good precision for the period January 2010 to April 2010, however since no automatic monitoring data is available for the site an assessment of accuracy cannot be reliably made.

Figure A2 – Precision and Accuracy of Triplicate Tubes



Appendix 2

Annualisation procedure

Table A1 – Harwell AURN site NO₂ data

Year	Month	Harwell AURN NO ₂ / µg·m ⁻³	Notes
2008	1	8.8	Monthly averages calculated using only data from days without missing intervals.
	2	25.0	
	3	6.6	
	4	9.5	
	5	12.7	
	6	5.3	
	7	5.9	
	8	5.1	
	9	13.2	
	10	7.8	
	11	10.7	
	12	13.9	
2009	1	16.2	
	2	16.1	
	3	9.4	
	4	10.7	
	5	6.4	
	6	7.2	
	7	3.0	
	8	4.0	
	9	7.9	
	10	13.7	
	11	7.2	
	12	17.0	
2010	1	21.1	
	2	15.8	
	3	10.9	
	4	10.0	
	5	8.6	
	6	8.5	
	7	6.4	
	8	8.4	

Where annualisation of data has been calculated, bias-adjusted results are divided by the mean of AURN data from months for which diffusion tube data is available divided by the annual mean NO₂ from AURN data.

For example, annualisation of data from site 23 is as follows:

Bias-adjusted mean site 23 NO₂ Dec '09 to Jul '10 = 22.4 µg·m⁻³

Mean AURN Dec '09 to Jul '10 = 12.3 µg·m⁻³

Mean AURN Aug '09 to Jul '10 = 10.9 µg·m⁻³

Annualisation factor = 1.125

Annualised mean site 23 NO₂ = 22.4 ÷ 1.125 = 19.9 µg·m⁻³

For 2010 annualisation of site 15 data (recorded from Jan '10 to Jul '10), the above method is adjusted as follows in order to represent the full year:

Mean AURN Jan '10 to Aug '10 = 11.2 µg·m⁻³

Mean AURN Jan '09 to Aug '09 = 9.1 µg·m⁻³

Mean AURN Jan '09 to Dec '09 = 9.9 µg·m⁻³

Projected AURN Jan '10 to Dec '10 = 11.2 × (9.9 ÷ 9.1) = 12.2 µg·m⁻³

Mean AURN Jan '10 to Jul '10 = 11.6 µg·m⁻³

Annualisation factor = 11.6 ÷ 12.2 = 0.956

Annualisation factors for all sites and data periods used in this report calculated using this data and method, and are given below in Table A2:

Table A2 – Annualisation factors

Site ID	Period	Data Capture	Annualisation factor
15	Jan '08 – Dec '08	75%	0.900
	Jan '09 – Dec '09	83%	0.996
	Jan '10 – Dec '10	58%	0.956
	Aug '09 – Jul '10	92%	1.058
23	Aug '09 – Jul '10	67%	1.125
24		67%	1.125
25		67%	1.125
26		67%	1.125
27		67%	1.125
28		67%	1.125



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