2012 Air Quality Updating and Screening Assessment for *Richmondshire District Council*

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

June 2012

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Executive Summary

This report was compiled following the Technical Guidance TG(09) published by DEFRA in February 2009. It contains new data from existing monitoring sites and an assessment of pollutant sources not covered by previous rounds of Review and Assessment which includes changes to existing sources.

No exceedences of any of the Government's Air Quality Strategy pollutant objectives have been predicted therefore no further action is required other than to continue monitoring at the existing sites.

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1 Introduction

1.1 Description of Local Authority Area

The District of Richmondshire (Figure 1) is largely rural and incorporates Wensleydale and Swaledale within North Yorkshire. A large proportion of the District is located within the Yorkshire Dales National Park. It has a population of approximately 50,000 inhabitants, most of who reside in the small towns of Richmond, Leyburn and Hawes. Industry is limited to quarry processes and light industrial activities. The main source of emissions to air is vehicles on the A1 and A66 trunk routes, which pass through the east of the District.

Figure 1 The District of Richmondshire

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 micrograms per cubic metre $\mu g/m^3$ (milligrammes per cubic metre, mg/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 $\mu g/m^3$	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

Stage one of the Review and Assessment[i] indicated that benzene, 1,3-butadiene, lead and sulphur dioxide were likely to meet the air quality standards throughout the district, but that carbon monoxide, nitrogen dioxide and PM_{10} required further investigation. The stage 2 report[ii] included short-term monitoring data from a number of worst-case locations. These showed that exceedences of the carbon monoxide, nitrogen dioxide and PM_{10} objectives were unlikely and therefore no further work was required for round one. The appraisal carried out on behalf of Defra, accepted the conclusions although it was noted that the approach taken was not in accordance with the LAQM guidance. Reports from the first round Review and Assessment are summarised in Table 1.4.1.

The second round Updating Screening Assessment (USA)[iii] recommended that a Detailed Assessment be carried out for sulphur dioxide produced from domestic solid fuel burning in towns and villages without mains gas. The Detailed Assessment[iv] concluded that no further action was required for sulphur dioxide. The 2005 progress report[v] concluded that no action was required for any of the above pollutants. Reports from the second round Review and Assessment are summarised in Table 1.4.2.

The third round of Review and Assessment began in 2006 with another Updating and Screening Assessment (USA). The 2006 USA[vi] concluded that there was no likelihood of exceedences of any of the air quality objectives.
The 2007 Progress Report[vii] concluded there was no likelihood of the exceedence of any of the air quality objectives. As a precaution diffusion tubes were placed at strategic locations along the A66 within the District to see if upgrading the road to dual carriageway has caused an exceedence of the nitrogen dioxide objectives. The tubes were in place for 12 months, but no likelihood of exceedence of the annual mean nitrogen dioxide objective was found.
The 2008 Progress Report[viii] concluded there was no likelihood of the exceedence of any of the air quality objectives but recognised that work to upgrade the A1 from 2 to 3-lane carriageway within the District will begin imminently with an estimated

completion date during 2010. Reports from the third round Review and Assessment are summarised in Table 1.4.3.

The fourth round Updating and Screening Assessment (2009)[ix] included an assessment of the potential effect on air quality of the A1 carriageway improvements. The Highways Agency's predictions (calculated using the Design Manual for Roads and Bridges; Vol 5) concluded that on completion of the scheme, the properties nearest to the carriageway within the Richmondshire District Council boundary would not be exposed to air pollution concentrations above the Air Quality Objectives for PM_{10}, nitrogen dioxide, carbon monoxide, benzene and 1,3-butadiene.
In addition to the A1 carriageway improvements, a source of pollution from a biomass combustion process (50kW to 20MW) was identified in the village of Ravensworth, 6 miles north of Richmond and within 750m of the A66 Trunk Road. The USA included a screening assessment for the effect of emissions from this plant (PM_{10} and nitrogen dioxide) in accordance with the Technical Guidance TG(09).
The screening assessment included the emissions from the combustion process combined with other potential emission sources in the vicinity of the plant. It was concluded that it was unnecessary to proceed to a Detailed Assessment for this process.
The overall conclusion of the 2009 USA was that there were no likely exceedences of any of the national Air Quality Strategy pollutant objectives but that the ongoing nitrogen dioxide diffusion tube monitoring should continue.
The 2010 and 2011 Progress Reports[x, xi] concluded that no action was required for any of the National Air Quality Strategy pollutants listed in table 1.1 above.
A summary of the fourth round Review and Assessment is presented in Table 1.4.4.

The fifth round of Review and Assessment begins with this 2012 USA.

Table 1.4.1 Summary of the First Round of Review and Assessment

Stage 1	
Benzene	No significant industrial processes. No need for further consideration.
1,3 butadiene	No significant industrial processes. No need for further consideration
Carbon monoxide	No significant industrial processes. A1 greater than 50,000 vehicles per day. **Stage 2 required**.
Lead	No significant industrial processes. No need for further consideration
Nitrogen dioxide	No significant industrial processes. A1 greater than 20,000 vehicles per day. **Stage 2 required**.
PM_{10}	Quarry processes at Redmire, Leyburn, Barton and Fawcett. A1 greater than 25,000 vehicles per day. **Stage 2 required**.
Sulphur dioxide	No significant industrial processes. No need for further consideration.
Appraisal Summary	Conclusions accepted for all pollutants other than SO_2. Coal or heavy fuel oil boilers > 5MWth were not considered. Exposure criteria have not been taken into account. Domestic sources of PM_{10} and SO_2 not considered. Planned developments not considered.

Stage 2	**December 1999**
Carbon monoxide	3 months monitoring 6m from kerb of A1. Results well below the objective. No need for further consideration.
Nitrogen dioxide	Monitoring using diffusion tubes at 4 sites for a 3-month period, including a site 6m from the kerb of the A1. Results indicated that concentrations are below the objective. No need for further consideration.
PM_{10}	Monitoring using a BAM at Brompton 6m from the A1 and near to quarries at Barton and Leyburn. Results indicated that concentrations are below the objectives. No need for further consideration.
Appraisal Summary	Conclusions accepted for all pollutants. Although, the approach taken is not in accordance with LAQM guidance.

Table 1.4.2 Summary of the Second Round of Review and Assessment

USA	July 2003
Sulphur Dioxide	Presence of densely populated villages without a mains gas supply requires a Detailed Assessment for emissions from domestic fuel use.
Appraisal Summary	Conclusions accepted for all pollutants.

Detailed Assessment	2004/2005
Sulphur Dioxide	Fuel use survey revealed Middleham to have over 100 properties within a 500m x 500m area that use solid fuel as primary heating source. 3 months monitoring between December 2004 and March 2005 revealed an AQMA was not necessary. As Middleham has the highest concentration of properties with solid fuel as their primary source of heating, no further action was required for other settlements.
Appraisal Summary	Conclusions accepted for sulphur dioxide.

Progress Report	April 2005
All pollutants	No exceedences of objectives expected. No further action required for all pollutants.
Appraisal Summary	Conclusions accepted for all pollutants.

Table 1.4.3 Summary of the Third Round of Review and Assessment

USA	April 2006
All pollutants	No exceedences of objectives expected. No further action required for all pollutants.
Appraisal Summary	Conclusions accepted for all pollutants.

Progress Report	April 2007
Nitrogen Dioxide	Upgrade of A66 to duel carriageway. A 12-month diffusion tube monitoring campaign along its length will determine whether there are any exceedences of the annual objective.
Appraisal Summary	Conclusions accepted for all pollutants.

Progress Report	April 2008
All pollutants	No exceedences of objectives expected (including interim results for the A66 monitoring campaign). No further action required for all pollutants except for continuation of monitoring campaign along A66.
Appraisal Summary	Conclusions accepted for all pollutants.

Table 1.4.4 Summary of the Fourth Round of Review and Assessment

USA	April 2009
All pollutants	Screening assessments undertaken for A1 carriageway improvements and a biomass combustion process. No exceedences of Air Quality Objectives expected. No further action required for all pollutants.
Appraisal Summary	Conclusions accepted for all pollutants.

Progress Report	April 2010
All pollutants	No exceedences of objectives expected (including interim results for the A66 monitoring campaign). No further action required for all pollutants except for continuation of monitoring campaign along A66.
Appraisal Summary	Conclusions accepted for all pollutants.

Progress Report	April 2011
All pollutants	No exceedences of objectives expected (including interim results for the A66 monitoring campaign). No further action required for all pollutants except for continuation of monitoring campaign along A66.
Appraisal Summary	Conclusions accepted for all pollutants.

2 New Monitoring Data

2.1 Summary of Monitoring Undertaken

2.1.1 Automatic Monitoring Sites

No automatic monitoring is undertaken within Richmondshire.

2.1.2 Non-Automatic Monitoring Sites

There are two distinct areas in which diffusion tube monitoring is undertaken for nitrogen dioxide, Richmond town centre and at properties located adjacent to the A66 Trunk Road.

Richmond Town Centre

Nitrogen dioxide has been measured using diffusion tubes at four locations in Richmond, originally as part of the now disbanded National Diffusion Tube Network. They continue to provide valuable information regarding NO_2 levels and assist with the process of local air quality management. Table 2.1 below summarises the location and exposure for the tubes in Richmond town centre. The location of these tubes is also shown in the map at Figure 2.1.

Table 2.1 Details of Non- Automatic Monitoring Sites in Richmond Town Centre

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 ?
R1	Roadside	X 416688 Y 501097	NO_2	N	Y (0.5m)	2m	Y
R2	Roadside	X 417180 Y 501125	NO_2	N	Y (8m)	2m	Y
R3	Roadside	X 418066 Y 501490	NO_2	N	Y (22m)	1m	Y
R4	Urban Background	X 418504 Y 501455	NO_2	N	Y (250m)	2m	Y

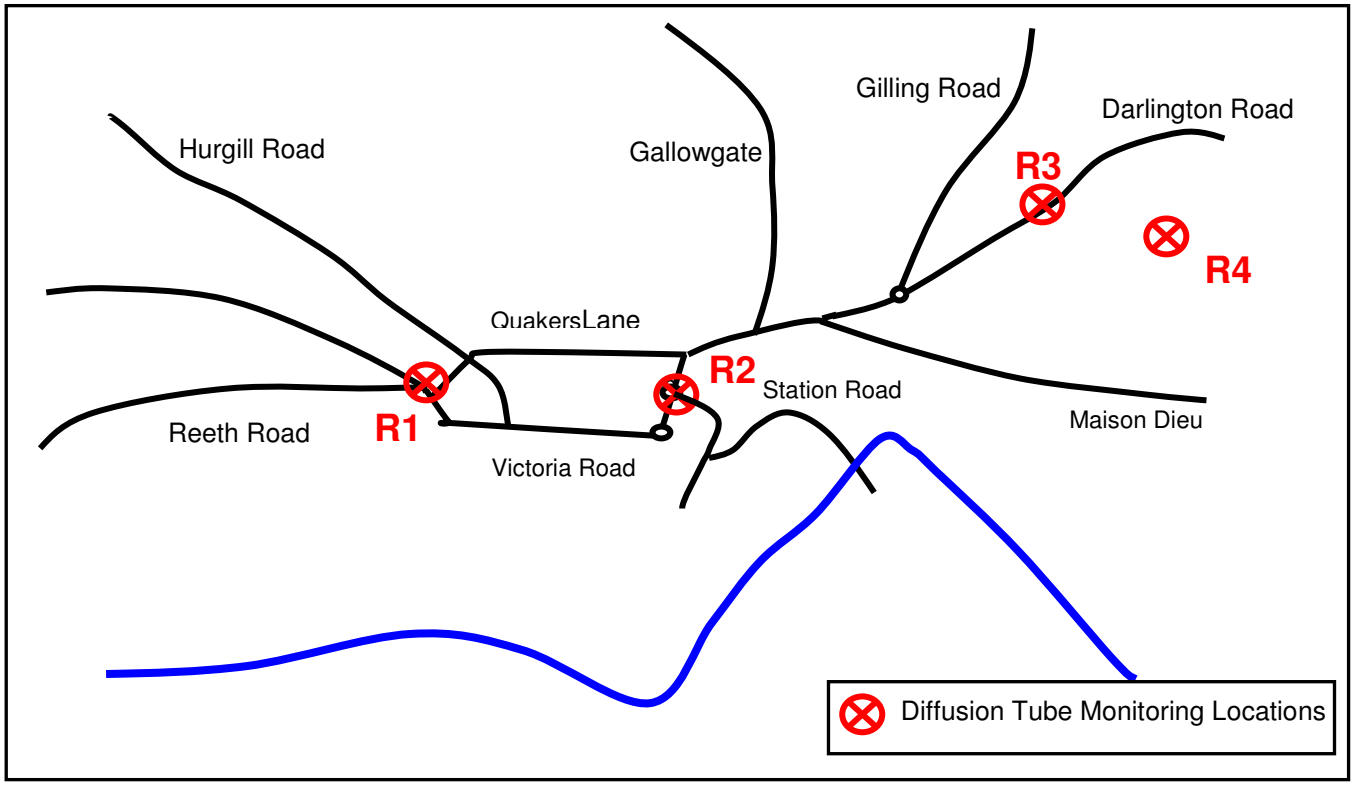
The tubes are positioned on lampposts adjacent to major roads running through Richmond. These locations were selected for the following reasons:

1. Richmond is the largest settlement in the District and therefore attracts the greatest volume of traffic;
2. Residential properties are located alongside these roads;
3. The route through Richmond is the main link from the A1 to Wensleydale and Swaledale.

Table 2.1 indicates the distances from the diffusion tube locations to the façade of the nearest residential dwelling. All have relevant exposure:

- R1 is located on a lamppost outside a property on the main road out of Richmond heading towards Wensleydale and Swaledale.
- R2 is located next to a roundabout at a junction in the centre of Richmond.
- R3 is located outside a children's nursery on the main road into Richmond from the A1.
- R4 is located in a quiet estate 250m from the same road as the R3 location.

Figure 2.1 Map of Non-Automatic Monitoring Sites



A66 Trunk Road

The purpose of the nitrogen dioxide diffusion tube monitoring along the A66 Trunk Road is to re-assess the potential for an exceedence of the Air Quality Objective from the carriageway improvements undertaken in 2006 and 2007.

Diffusion tubes were exposed monthly at three locations from November 2007 to October 2008. Details of these locations are shown in Table 2.2. All are fixed at the facade of the buildings and are therefore relevant exposures.

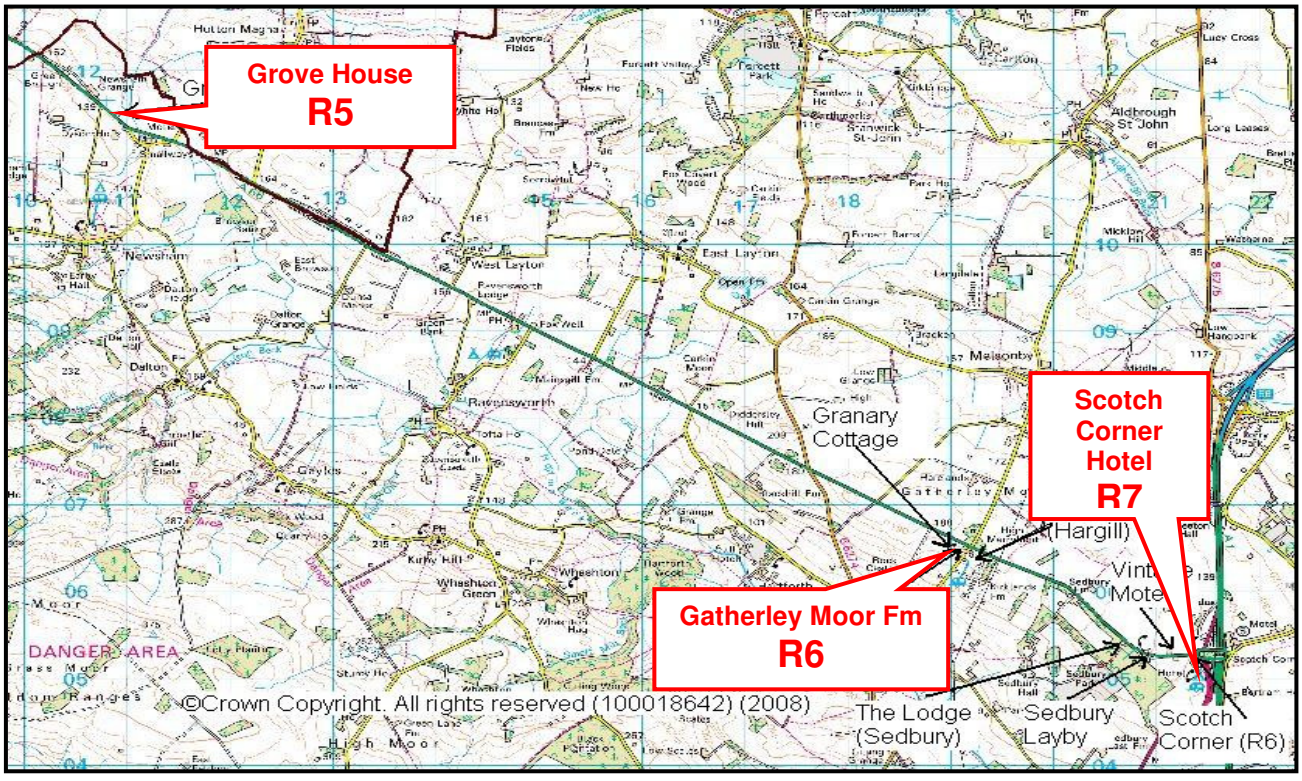
Following advice from the 2009 USA monitoring recommenced from 30 Sept 2009.

A map of these locations is shown at Figure 2.2.

Table 2.2 Details of Non- Automatic Monitoring Sites Along the A66 Trunk Road

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 ?
R5 Grove House	Roadside	X 410902 Y 511462	NO_2	N	Y (0m)	9m	Y
R6 Gatherley Moor Farm	Roadside	X 419207 Y 506509	NO_2	N	Y (0m)	8m	Y
R7 Scotch Corner Hotel	Roadside	X 421366 Y 505261	NO_2	N	Y (0m)	22m	Y

Figure 2.2 Location of Diffusion Tubes Along A66 Trunk Road



QA/QC Details of the Nitrogen Dioxide Diffusion Tube Survey

The diffusion tubes are supplied and analysed by Environmental Scientifics Group (ESG) - formerly Harwell Scientifics, Didcot, Oxfordshire, which is part of the WASP laboratory inter-comparison scheme. The tubes contain a mesh which is doped with 50% v/v triethanolamine (TEA) in acetone. They are exposed according to the monthly schedule supplied by AEA. Until the 31st March 2010 the diffusion tubes, although supplied by Harwell Scientifics, were analysed by Jesmond Dene Laboratory in Newcastle upon Tyne. The Jesmond Dene QA/QC arrangements are detailed in the 2010 Progress Report.[x]

A summary of the current QA/QC arrangements applied to the diffusion tubes is provided in Table 2.3.

Table 2.3 Nitrogen Dioxide Diffusion Tube Monitoring QA/QC

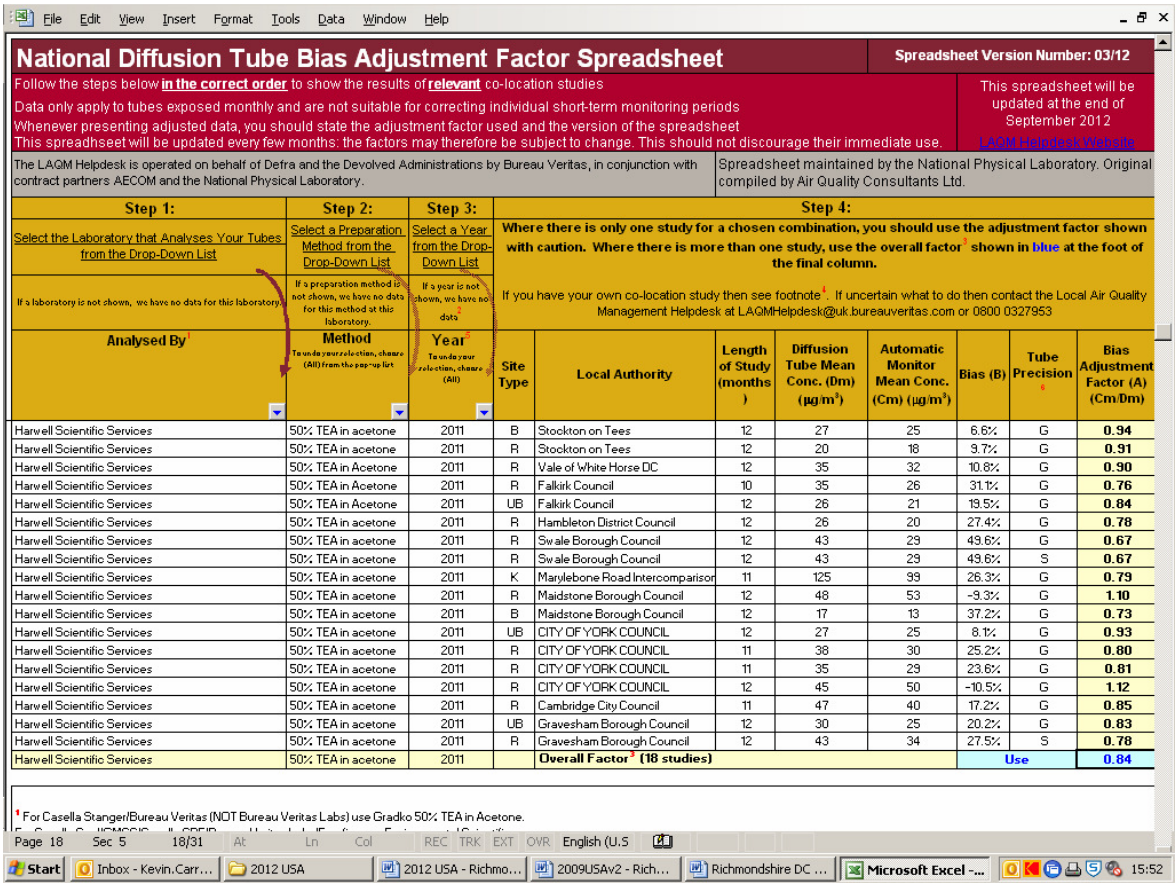
Supply	Environmental Scientifics Group (formerly Harwell Scientifics)
Analysis	Environmental Scientifics Group (formerly Harwell Scientifics)
Preparation Method	50% v/v TEA in acetone
Type of tube	Palmes tube
Type of absorbent	Doped triethanolamine mesh
Membership of inter-laboratory comparison scheme	WASP
Satisfactory Results (%)	100
Method accreditation	UKAS
Conforms to Harmonisation Practical Guidance	Yes

The ESG laboratory conforms to the Harmonisation Practical Guidance[xii]. ESG participates in the Health and Safety Laboratory's (HSL) Workplace Analysis Scheme for Proficiency (WASP) programme for diffusion tubes, which provides a Quality Assurance / Quality Control (QA/QC) framework for local authorities carrying out diffusion tube monitoring as a part of their local air quality management process. The percentage of results submitted from ESG determined to be satisfactory was 100% of all tests between round 108 (January-March 2010) and round 115 (October-December 2011).[xiii] A table demonstrating these findings is displayed in the appendix.

It is known that there are systematic differences in the performance of different laboratories and preparation methods of diffusion tubes. Figure 2.3 shows the studies that have been used to compare results from diffusion tubes (analysed by the same laboratory as used by Richmondshire District Council) to results of co-located automatic chemiluminesence monitors, where data has been collected for 9 months or more.

From the ESG co-location studies it can be seen that the bias adjustment factor of 0.84 has therefore to be applied (multiplied) to the 2011 diffusion tube results (see Figure 2.3).

Figure 2.3 Environmental Scientifics Group (formerly Harwell Scientific Services) Bias Adjustment Factor[xiv]



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National Diffusion Tube Bias Adjustment Factor Spreadsheet — Spreadsheet Version Number: 03/12

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 spreadsheet 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 at the end of September 2012
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: Select the Laboratory that Analyses Your Tubes from the Drop-Down List — If a laboratory is not shown, we have no data for this laboratory.

Step 2: Select a Preparation Method from the Drop-Down List — If a preparation method is not shown, we have no data for this method at this laboratory.

Step 3: Select a Year from the Drop-Down List — If a year is not shown, we have no data.

Step 4: 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 shown in blue at the foot of the final column.

If you have your own co-location study then see footnote. If uncertain what to do then contact the Local Air Quality Management Helpdesk at LAQMHelpdesk@uk.bureauveritas.com or 0800 0327953

Analysed By	Method (To undo your selection, choose (All) from the pop-up list)	Year (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	Bias Adjustment Factor (A) (Cm/Dm)
Harwell Scientific Services	50% TEA in acetone	2011	B	Stockton on Tees	12	27	25	6.6%	G	0.94
Harwell Scientific Services	50% TEA in acetone	2011	R	Stockton on Tees	12	20	18	9.7%	G	0.91
Harwell Scientific Services	50% TEA in Acetone	2011	R	Vale of White Horse DC	12	35	32	10.8%	G	0.90
Harwell Scientific Services	50% TEA in Acetone	2011	R	Falkirk Council	10	35	26	31.1%	G	0.76
Harwell Scientific Services	50% TEA in Acetone	2011	UB	Falkirk Council	12	26	21	19.5%	G	0.84
Harwell Scientific Services	50% TEA in acetone	2011	R	Hambleton District Council	12	26	20	27.4%	G	0.78
Harwell Scientific Services	50% TEA in acetone	2011	R	Swale Borough Council	12	43	29	49.6%	G	0.67
Harwell Scientific Services	50% TEA in acetone	2011	R	Swale Borough Council	12	43	29	49.6%	S	0.67
Harwell Scientific Services	50% TEA in acetone	2011	K	Marylebone Road Intercomparison	11	125	99	26.3%	G	0.79
Harwell Scientific Services	50% TEA in acetone	2011	R	Maidstone Borough Council	12	48	53	-9.3%	G	1.10
Harwell Scientific Services	50% TEA in acetone	2011	B	Maidstone Borough Council	12	17	13	37.2%	G	0.73
Harwell Scientific Services	50% TEA in acetone	2011	UB	CITY OF YORK COUNCIL	12	27	25	8.1%	G	0.93
Harwell Scientific Services	50% TEA in acetone	2011	R	CITY OF YORK COUNCIL	11	38	30	25.2%	G	0.80
Harwell Scientific Services	50% TEA in acetone	2011	R	CITY OF YORK COUNCIL	11	35	29	23.6%	G	0.81
Harwell Scientific Services	50% TEA in acetone	2011	R	CITY OF YORK COUNCIL	12	45	50	-10.5%	G	1.12
Harwell Scientific Services	50% TEA in acetone	2011	R	Cambridge City Council	11	47	40	17.2%	G	0.85
Harwell Scientific Services	50% TEA in acetone	2011	UB	Gravesham Borough Council	12	30	25	20.2%	G	0.83
Harwell Scientific Services	50% TEA in acetone	2011	R	Gravesham Borough Council	12	43	34	27.5%	S	0.78
Harwell Scientific Services	50% TEA in acetone	2011		**Overall Factor (18 studies)**				Use		0.84

For Casella Stanger/Bureau Veritas (NOT Bureau Veritas Labs) use Gradko 50% TEA in Acetone.

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2.2 Comparison of Monitoring Results with AQ Objectives

2.2.1 Nitrogen Dioxide

Automatic Monitoring Data

No automatic monitoring is undertaken within Richmondshire.

Diffusion Tube Monitoring Data

The annual average monitoring data for the seven nitrogen dioxide diffusion tubes is shown in Table 2.4. The full dataset (monthly mean values) may be viewed in the appendix.

Table 2.4 Results of Nitrogen Dioxide Diffusion Tubes in 2011

Site ID	Location	Site Type	Within AQMA?	Triplicate or Co-located Tube	Data Capture 2011 (Number of Months or %)	Data with less than 9 months has been annualised (Y/N)	Confirm if data has been distance corrected (Y/N)	Annual mean concentration (Bias Adjustment factor = 0.84) 2011 (µg/m^3)
R1	38 Victoria Road Richmond North Yorkshire DL10 4UA	Roadside	N	Single tube not co-located	12 months (100%)	N	N	19
R2	5 Queens Road Richmond North Yorkshire DL10 4AJ	Roadside	N	Single tube not co-located	12 months (100%)	N	N	25
R3	Ridgeway Nursery 47 Darlington Road Richmond North Yorkshire DL10 7BG	Roadside	N	Single tube not co-located	12 months (100%)	N	N	19
R4	1 White Rose Cres. Richmond North Yorkshire DL10 7DW	Urban Background	N	Single tube not co-located	12 months (100%)	N	N	9
R5	Gatherley Moor Farm Gilling West Richmond North Yorkshire DL10 5LJ	Roadside	N	Single tube not co-located	12 months (100%)	N	N	24
R6	Grove House Newsham Richmond North Yorkshire DL11 7QR	Roadside	N	Single tube not co-located	12 months (100%)	N	N	14
R7	Scotch Corner Hotel Scotch Corner Middleton Tyas Richmond North Yorkshire DL10 6NR	Roadside	N	Single tube not co-located	12 months (100%)	N	N	19

The annual mean nitrogen dioxide concentrations for the years 2007 to 2011 for the seven monitoring locations in Richmondshire are shown in Table 2.5. The results demonstrate a trend over the last 5 years for a slight reduction in NO_2 levels in the district.

Table 2.5 Results of Nitrogen Dioxide Diffusion Tubes (2007 to 2011)

Site ID	Site Type	Within AQMA?	Annual mean concentration (adjusted for bias) µg/m^3				
			2007 (Bias Adjustment Factor = 0.79)	2008 (Bias Adjustment Factor = 0.76)	2009 (Bias Adjustment Factor = 0.76)	2010 (Bias Adjustment Factor = 0.85)	2011 (Bias Adjustment Factor = 0.84)
R1	Roadside	N	21	20	19	22	19
R2	Roadside	N	27	23	25	28	25
R3	Roadside	N	19	16	16	25	19
R4	Urban Background	N	12	9	11	11	9
R5	Roadside	N	No Data	24	18†	29	24
R6	Roadside	N	No Data	17	16†	17	14
R7	Roadside	N	No Data	21	21†	22	19

† Annualised Means – see 2010 Progress Report.

Figure 2.4 Trends in Annual Mean Nitrogen Dioxide Concentrations measured at Diffusion Tube Monitoring Sites

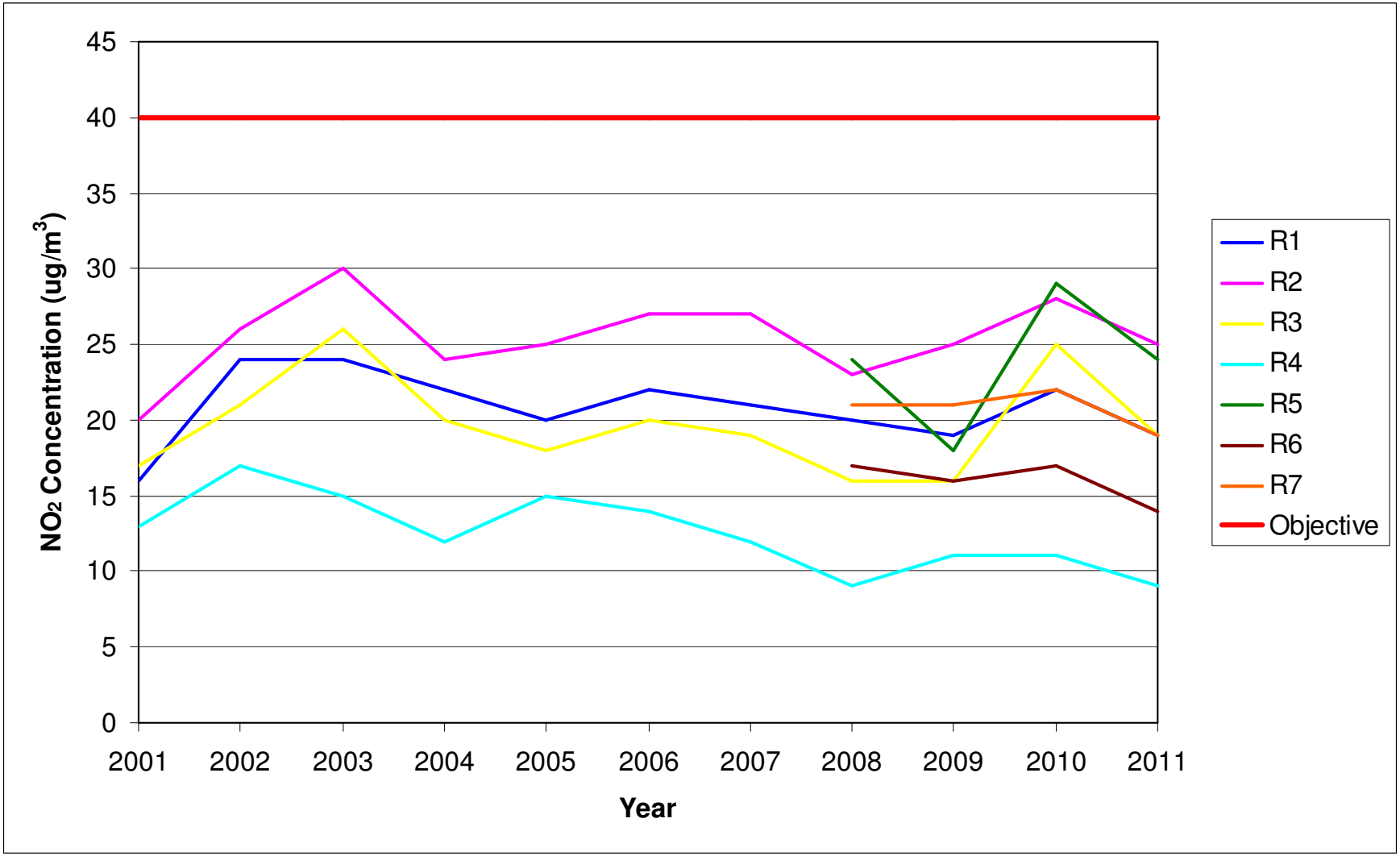


Figure 2.4 indicates that over the last 10 years the general trend of nitrogen dioxide concentrations within Richmond and along the A66 was falling, although 2010 saw a slight rise. This rise could potentially be explained by the change in analytical laboratory from April 2010 and the lack of a bias adjustment factor for the data from the beginning of January 2010 to the end of March 2010.

All concentrations are below the Annual Mean Air Quality Objective of 40μg/m^3.

Research referred to in the technical guidance TG(09), issued by DEFRA[xv], has shown that where the Annual Mean nitrogen dioxide concentration is less than 60 μg/m^3 an exceedence of the 1-hour Air Quality Objective is unlikely, except for a few kerbside sites in London.

As all monitoring undertaken by Richmondshire District Council shows nitrogen dioxide concentrations to be well below this level, it is stated with some confidence that the **1-hour mean Air Quality Objective for nitrogen dioxide is unlikely to be exceeded.**

2.2.2 PM_{10}

There is no monitoring of PM_{10} within in the District of Richmondshire as there are no additional sources or changes to existing sources since the previous updating review and assessments.

2.2.3 Sulphur Dioxide

There is no monitoring of sulphur dioxide within in the District of Richmondshire as there are no additional sources or changes to existing sources since the previous updating review and assessments.

2.2.4 Benzene

There is no monitoring of Benzene within in the District of Richmondshire as there are no additional sources or changes to existing sources since the previous updating review and assessments.

2.2.5 Other pollutants monitored

No other pollutants are monitored within in the District of Richmondshire due to a lack of possible emission sources.

2.2.6 Summary of Compliance with AQS Objectives

Richmondshire District Council has examined the results from monitoring in the district. Concentrations are all below the objectives, therefore there is no need to proceed to a Detailed Assessment.

3 Road Traffic Sources

3.1 Narrow Congested Streets with Residential Properties Close to the Kerb

Richmondshire District Council 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

Richmondshire District Council 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.

Richmondshire District Council confirms that there are no new/newly identified roads with high flows of buses/HDVs.

3.4 Junctions

Richmondshire District Council 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

The proposed upgrading of the A1 from 2 to 3-lane carriageway between Leeming and Barton (see 2009 USA[ix]) has been cancelled due to central Government spending cutbacks. Any remaining upgrades to the A1 will not be within the Richmondshire District Council boundary.

Richmondshire District Council confirms that there are no new/proposed roads.

3.6 Roads with Significantly Changed Traffic Flows

Richmondshire District Council confirms that there are no new/newly identified roads with significantly changed traffic flows.

3.7 Bus and Coach Stations

Richmondshire District Council confirms that there are no relevant bus stations in the Local Authority area.

4 Other Transport Sources

4.1 Airports

Richmondshire District Council confirms that there are no airports in the Local Authority area.

4.2 Railways (Diesel and Steam Trains)

4.2.1 Stationary Trains

Richmondshire District Council 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

Richmondshire District Council 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)

Richmondshire District Council 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

Richmondshire District Council 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

Richmondshire District Council 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

Richmondshire District Council 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

Richmondshire District Council confirms that there are no petrol stations meeting the specified criteria.

5.4 Poultry Farms

Richmondshire District Council confirms that there are no poultry farms meeting the specified criteria.

6 Commercial and Domestic Sources

6.1 Biomass Combustion – Individual Installations

One appliance was identified as burning biomass between 50kW and 20MW units within Richmondshire. It is located at Ravensworth Nurseries, Ravensworth, a village about 6 miles north of Richmond with a population of approximately 240. The plant is also located about 750 meters south west of the A66. The location is illustrated in Figure 6.1. The plant is a 2MW Talbot C8 Boiler and is located inside a prefabricated building with a stack that protrudes through the top of the roof of the building. The relevant parameters are summarised in Table 6.1 below. The maximum emission rates were obtained from "Technical Guidance: screening assessment for biomass boilers" Abbott et al (July 2008)[xvi]. The appliance comes under the category of an Advanced Automatic Wood-burning Boiler as it has a fully automatic system for feeding of pellet / chipped fuels and for supply of combustion air, which is distributed into primary and secondary air. The boiler is equipped with a smaller pellet / chipped wood storage, which is fuelled by an automatic system from larger chamber storage. The pellets are introduced by screw into burner. These boilers are characterised by a high efficiency (usually above 80%) and their emissions are comparable to those of liquid fuel boilers.

Figure 6.1 Location of Biomass Plant at Ravensworth Nurseries, Ravensworth, Richmond.

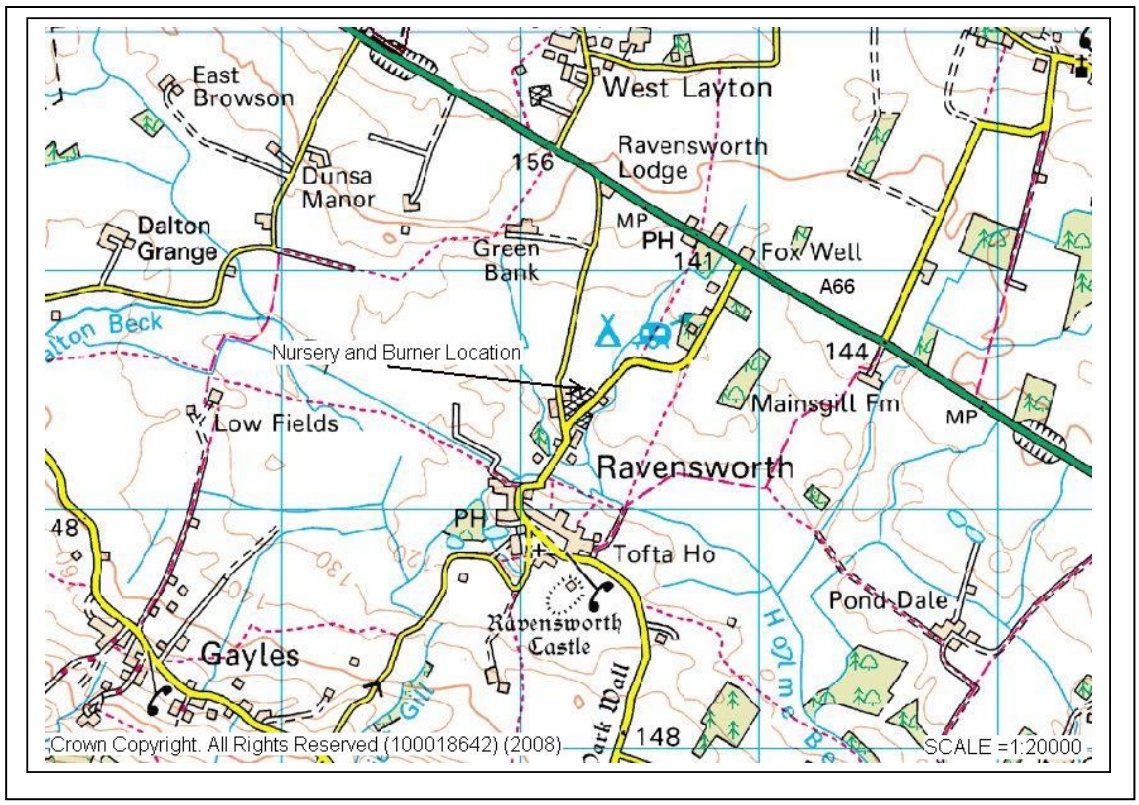


Table 6.1: Parameters of Ravensworth Nursery Biomass Combustion Plant

Talbot C8 Boiler	Output = 2 MW (2000kW)
Stack Diameter	0.5m
Stack Height (including building)	10m
Building Height	7m
NOx Emission Factor	150g/GJ
PM_{10} Emission Factor	66g/GJ
Maximum NOx Emission Rate	= Emission Rate (g/GJ) x Boiler Output (kW) x 10^{-6} = 150 x 2000 x 10^{-6} = 0.3g/s
Maximum PM_{10} Emission Rate	= Emission Rate (g/GJ) x Boiler Output (kW) x 10^{-6} = 66 x 2000 x 10^{-6} = 0.132g/s
Background NO_2 Concentration[xvii]	7 µg m^{-3}
Background PM_{10} Concentration[xvii]	13 µg m^{-3}

The building containing the combustion plant is the tallest building within 5 actual stack heights distance from it and the height of release from the stack is not greater than 3m above the building. Therefore, according to the Technical Guidance TG (09)[xi], the effective stack height is the same as the actual (physical) stack height i.e. 10m.

Figures 6.2 and 6.3 show the 2010 background concentrations of NO_2 and PM_{10} in Richmondshire in relation to the rest of the United Kingdom of Great Britain and Northern Ireland.[xvii]

PM_{10}

Nomograms contained in the Technical Guidance TG (09)[xi] may be used to assess whether the biomass combustion installation is likely to lead to an exceedence of the 24 hour objective for PM_{10}. First, a "background- adjusted" emission rate E_A is calculated using:

$$E_A = \frac{E}{(32 - G)}$$

where: E is the emission rate in g s-1 for the plant operating at capacity; and G is the annual average background concentration in µg m^{-3}. The 32 µg m^{-3} represents the annual average concentration at which given a typical distribution of concentrations with time the 90th percentile of 24 hour means will exceed the objective.

For this biomass combustion plant E_A = 0.007g/s which is slightly above the threshold emission rate for the 90th percentile of 24-hour mean ground-level concentrations of 1 µg m^{-3} as illustrated on the relevant nomogram. Following discussions with the Local Air Quality Management Helpdesk, however, no further action is needed for

PM_{10} as the nearest property to the emissions source is greater than five times the chimney stack height.

Nitrogen dioxide, annual mean

A similar procedure applies for the annual mean nitrogen dioxide. The background adjusted emission rate for annual average oxides of nitrogen is calculated using:

$$E_A = \frac{E}{(40 - G)}$$

where: E is the emission rate in g s-1 at capacity; and G is the annual average background of nitrogen dioxide concentration in µg m^{-3}. The 40 µg m^{-3} represents the annual average objective.

For this biomass combustion plant E_A = 0.009g/s which is below the threshold emission rate to give an annual mean ground-level concentrations of 1 µg m^{-3} as illustrated on the relevant nomogram.

Nitrogen dioxide, 1 hour average

A similar procedure applies for the 1 hour average objective for nitrogen dioxide. The background adjusted emission rate for the hourly oxides of nitrogen is calculated using:

$$E_A = \frac{40E}{(200 - 2G)}$$

where: E is the emission rate in g s-1 at capacity; and G is the annual average background nitrogen dioxide concentration in µg m^{-3}. The background concentration is multiplied by two to represent the typical ratio between the annual mean and the 99.8th percentile of 1 hour means taking into account the partial correlation between the variation in background concentration and the dispersion of a given plume which is then subtracted from the objective.

For this biomass combustion plant E_A = 0.065g/s which is below the threshold emission rate to give a 90^{th} percentile of 24-hour mean ground-level concentrations of 40 µg m^{-3} as illustrated on the relevant nomogram. No further action is therefore needed for nitrogen dioxide.

Richmondshire District Council has assessed the biomass combustion plant, and concluded that it will not be necessary to proceed to a Detailed Assessment.

6.2 Biomass Combustion – Combined Impacts

The effect of solid fuel burning on PM_{10} levels has already been considered in previous review and assessments. Within the District of Richmondshire there are a number of villages which do not have a mains gas supply and therefore may have a higher than average density of households burning solid fuel. Of these villages, those with the highest housing densities are Reeth and Middleham which both have over 300 properties in a single 500m x 500m area. However, the background PM_{10} concentrations in these areas are low (less than 15 $\mu g/m^3$ in 2004) and therefore according to the nomograms provided in the Technical Guidance[xiv], even if all of these households used coal, it would be unlikely that there would be an exceedence of the objectives.

The presence of the biomass combustion plant at Ravensworth Nurseries has not been considered however. The following method of calculating the combined impacts of PM_{10} emissions from biomass combustion is taken from the Technical Guidance TG(09).

The number of appliances identified in a 500m x 500m area including the biomass combustion plant at Ravensworth Nurseries is:

- 1 Automatic wood-fired boiler with emissions of PM_{10} per hectare of service sector floorspace of 295kg/year.
- 13 domestic properties (assume worst-case wood-burning fireplaces) with emissions of PM_{10} per household of 27.43kg/year.

.
The floorspace at Ravensworth Nurseries has been estimated using GIS as being approximately 30 Hectares which gives total PM_{10} emissions of 295 x 30 = 8850kg/year.

The sum of the PM_{10} emissions from the domestic properties is 27.43 x 13 = 356.59kg/year.

Therefore the total PM_{10} emissions for the 500m x 500m area is:

8850 + 356.59 = 9206.59kg/year.

As already mentioned in Section 6.1, the background PM_{10} concentration at this location is 13 $\mu g\ m^{-3}$.

Even assuming the whole area is occupied and not adjusting this figure for percentage area cover as suggested in TG(09), the source does not exceed the relevant nomogram. No further action is therefore required for PM_{10} at this location.

Richmondshire District Council has assessed the biomass combustion plant, and concluded that it will not be necessary to proceed to a Detailed Assessment.

Figure 6.2 Annual mean background NO2 concentration 2010 (µg m^{-3})

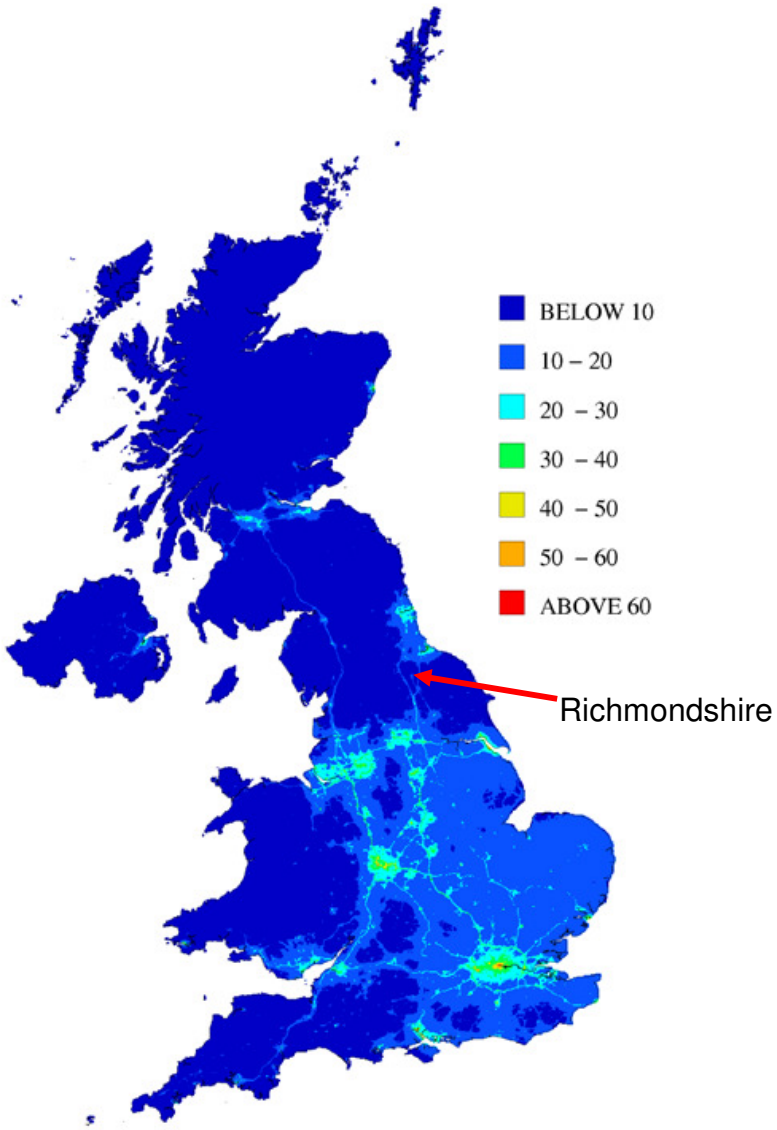
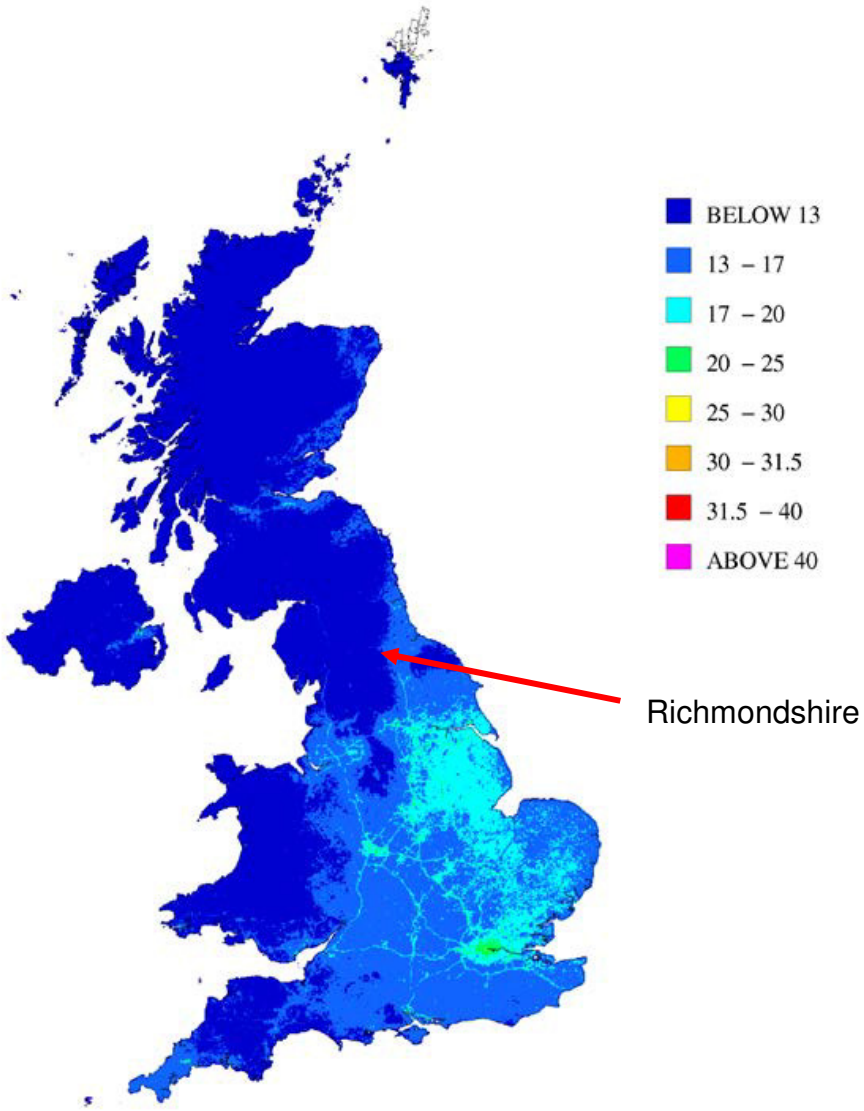


Figure 6.3 Annual mean background PM_{10} concentration, 2010 (µg m^{-3}, gravimetric)



6.3 Domestic Solid-Fuel Burning

Richmondshire District Council confirms that there are no areas of significant domestic fuel use in the Local Authority area.

7 Fugitive or Uncontrolled Sources

Richmondshire District Council 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

Traffic-derived nitrogen dioxide is the only major pollutant source identified within Richmondshire and is monitored by diffusion tubes. As there have been no exceedences of the current annual mean objective and there does not appear to be any likelihood of future exceedences, no further action is required other than to continue monitoring for the purposes of Review and Assessment.

8.2 Conclusions from Assessment of Sources

There have been no predicted exceedences of any of the pollutant objectives from the assessment of new sources and changes to existing sources.

8.3 Proposed Actions

The Updating and Screening Assessment has not identified any need to proceed to a Detailed Assessment in any area. As no AQMA's exist in Richmondshire, the next course of action will be to produce the 2013 Progress Report.

9 References

i Richmondshire District Council (1999) Stage 1 Air Quality Review and Assessment.

ii Laxen, D (December 1999) Air Quality Monitoring in Richmondshire

iii Richmondshire District Council (2003) Updating and Screening Assessment of Air Quality in the District of Richmondshire

iv Richmondshire District Council (2005) Detailed Assessment of Sulphur Dioxide Emissions from Domestic Solid Fuel Sources

v Richmondshire District Council (2005) Air Quality in the District of Richmondshire Progress Report

vi Richmondshire District Council (2006) Updating and Screening Assessment of Air Quality in the District of Richmondshire.

vii Richmondshire District Council (2007) Air Quality in the District of Richmondshire – Progress Report.

viii Richmondshire District Council (2008) Air Quality in the District of Richmondshire – Progress Report.

ix Richmondshire District Council (2009) Updating and Screening Assessment of Air Quality in the District of Richmondshire.

x Richmondshire District Council (2010) Air Quality in the District of Richmondshire – Progress Report.

xi Richmondshire District Council (2011) Air Quality in the District of Richmondshire – Progress Report.

xii AEA (November 2008). WASP – Annual Performance Criteria for NO2 Diffusion Tubes used in Local Air Quality Management (LAQM), 2008 onwards and Summary of Laboratory Performance in Rounds 97 – 101.

xiii DEFRA (2012). Summary of Laboratory Performance in WASP NO2 Proficiency Testing
Scheme for Rounds 108-115.
http://laqm.defra.gov.uk/documents/WASP-Rounds-108-115-(January-2010-December-2011).pdf
Accessed 6th June 2012

xiv Spreadsheet of Diffusion Tube Bias Adjustment Factors source
http://laqm.defra.gov.uk/bias-adjustment-factors/national-bias.html
Accessed 6th June 2012

xv Defra, (February 2009), Local Air Quality Management, Technical Guidance LAQM.TG(09).

xvi Abbott J (July 2008) Technical Guidance: Screening Assessment for Biomass Boilers. AEA Energy and Environment.

xvii DEFRA (2012). 2010 Based Background Maps for NOx, NO2, PM10 and PM2.5
http://laqm.defra.gov.uk/maps/maps2010.html
Accessed 6th June 2012.

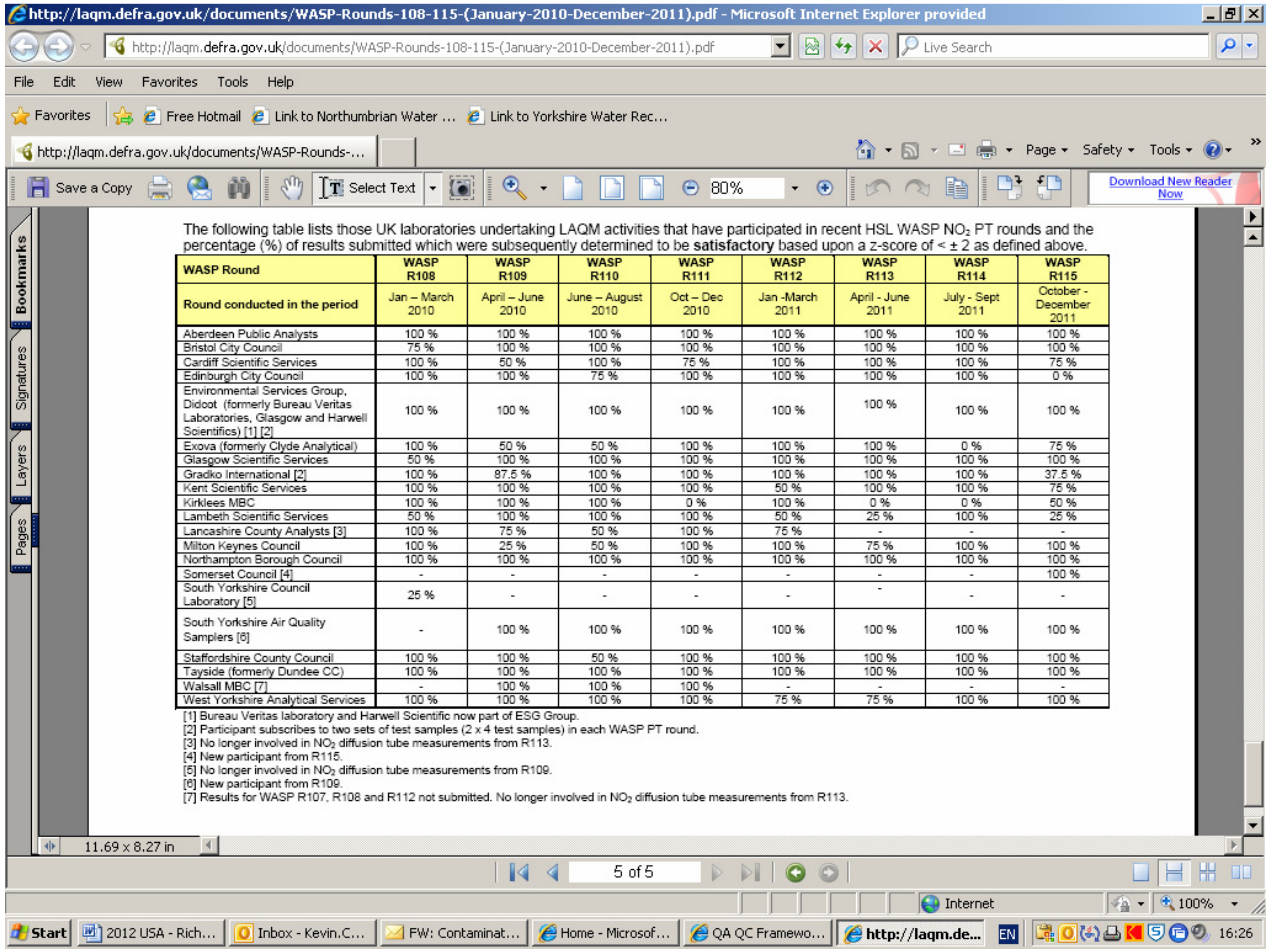
Appendix

Monthly Mean Diffusion Tube Nitrogen Dioxide Concentrations (µgm^{-3}) with Bias Adjustments

Period		Nitrogen Dioxide Concentration □g/m^3 Tube Ref No							Bias Adjusted NO_2 Concentration □g/m^3 Tube Ref No						
Date On	Date Off	R1	R2	R3	R4	R5	R6	R7	R1	R2	R3	R4	R5	R6	R7
05-Jan-11	04-Feb-11	28.6	36.9	28.6	16.7	39.5	20.7	29.4	24.0	31.0	24.0	14.0	33.2	17.4	24.7
04-Feb-11	02-Mar-11	37.4	50.3	35.1	23.7	48	29.8	42.2	31.4	42.3	29.5	19.9	40.3	25.0	35.4
02-Mar-11	30-Mar-11	28	36.3	20.9	13.4	37.5	20.8	29.7	23.5	30.5	17.6	11.3	31.5	17.5	24.9
30-Mar-11	27-Apr-11	21.7	26.5	18.3	8.5	32.8	15.1	24	18.2	22.3	15.4	7.1	27.6	12.7	20.2
27-Apr-11	01-Jun-11	14.3	23.9	16.1	7.5	22.3	15	15.4	12.0	20.1	13.5	6.3	18.7	12.6	12.9
01-Jun-11	29-Jun-11	12	21.9	12.1	4.4	22.2	11	15.1	10.1	18.4	10.2	3.7	18.6	9.2	12.7
29-Jun-11	03-Aug-11	18.9	29.7	14.9	5.8	25.4	12.6	24.8	15.9	24.9	12.5	4.9	21.3	10.6	20.8
03-Aug-11	31-Aug-11	14.2	21.9	14.4	5.8	22.1	12	2.2	11.9	18.4	12.1	4.9	18.6	10.1	1.8
31-Aug-11	28-Sep-11	17.8	31.6	23.5	9.2	29.3	19.4	21.2	15.0	26.5	19.7	7.7	24.6	16.3	17.8
28-Sep-11	02-Nov-11	22.3	36	25.4	10.6	29.7	19.6	25.3	18.7	30.2	21.3	8.9	24.9	16.5	21.3
02-Nov-11	30-Nov-11	39.9	48.8	36.8	26.4	41.5	27.5	41.4	33.5	41.0	30.9	22.2	34.9	23.1	34.8
30-Nov-11	04-Jan-12	16.7	21.5	19.5	10	24.9	14.5	15.1	14.0	18.1	16.4	8.4	20.9	12.2	12.7
Annual Mean		**22.7**	**29.6**	**22.1**	**10.9**	**25.8**	**16.8**	**22.0**	**19.0**	**24.9**	**18.6**	**9.2**	**24.2**	**14.1**	**18.5**

Bias Adjustment Factor = **0.84**

Laboratory summary performance for WASP NO2 PT rounds 108 – 115[xiii]



http://laqm.defra.gov.uk/documents/WASP-Rounds-108-115-(January-2010-December-2011).pdf - Microsoft Internet Explorer provided

The following table lists those UK laboratories undertaking LAQM activities that have participated in recent HSL WASP NO_2 PT rounds and the percentage (%) of results submitted which were subsequently determined to be **satisfactory** based upon a z-score of < ± 2 as defined above.

WASP Round	WASP R108	WASP R109	WASP R110	WASP R111	WASP R112	WASP R113	WASP R114	WASP R115
Round conducted in the period	Jan – March 2010	April – June 2010	June – August 2010	Oct – Dec 2010	Jan -March 2011	April - June 2011	July - Sept 2011	October - December 2011
Aberdeen Public Analysts	100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %
Bristol City Council	75 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %
Cardiff Scientific Services	100 %	50 %	100 %	75 %	100 %	100 %	100 %	75 %
Edinburgh City Council	100 %	100 %	75 %	100 %	100 %	100 %	100 %	0 %
Environmental Services Group, Didcot (formerly Bureau Veritas Laboratories, Glasgow and Harwell Scientifics) [1] [2]	100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %
Exova (formerly Clyde Analytical)	100 %	50 %	50 %	100 %	100 %	100 %	0 %	75 %
Glasgow Scientific Services	50 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %
Gradko International [2]	100 %	87.5 %	100 %	100 %	100 %	100 %	100 %	37.5 %
Kent Scientific Services	100 %	100 %	100 %	100 %	50 %	100 %	100 %	75 %
Kirklees MBC	100 %	100 %	100 %	0 %	100 %	0 %	0 %	50 %
Lambeth Scientific Services	50 %	100 %	100 %	100 %	50 %	25 %	100 %	25 %
Lancashire County Analysts [3]	100 %	75 %	50 %	100 %	75 %	-	-	-
Milton Keynes Council	100 %	25 %	50 %	100 %	100 %	75 %	100 %	100 %
Northampton Borough Council	100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %
Somerset Council [4]	-	-	-	-	-	-	-	100 %
South Yorkshire Council Laboratory [5]	25 %	-	-	-	-	-	-	-
South Yorkshire Air Quality Samplers [6]	-	100 %	100 %	100 %	100 %	100 %	100 %	100 %
Staffordshire County Council	100 %	100 %	50 %	100 %	100 %	100 %	100 %	100 %
Tayside (formerly Dundee CC)	100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %
Walsall MBC [7]	-	100 %	100 %	100 %	-	-	-	-
West Yorkshire Analytical Services	100 %	100 %	100 %	100 %	75 %	75 %	100 %	100 %

[1] Bureau Veritas laboratory and Harwell Scientific now part of ESG Group.
[2] Participant subscribes to two sets of test samples (2 x 4 test samples) in each WASP PT round.
[3] No longer involved in NO_2 diffusion tube measurements from R113.
[4] New participant from R115.
[5] No longer involved in NO_2 diffusion tube measurements from R109.
[6] New participant from R109.
[7] Results for WASP R107, R108 and R112 not submitted. No longer involved in NO_2 diffusion tube measurements from R113.