



2014 Air Quality Progress Report for Richmondshire District Council

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

May 2014

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Executive Summary

This report is the 2014 Progress Report on the current state of air quality in the Richmondshire District Council area. It has been prepared using the Local Air Quality Management Technical Guidance (LAQM.TG(09))¹⁹.

The National Air Quality Strategy sets a series of Air Quality Objectives for a range of pollutants against which the air quality in the District has been assessed.

The report outlines the conclusions of previous air quality assessments undertaken by the Council and specifically examines the results of ongoing nitrogen dioxide monitoring undertaken in Richmond town centre and along the A66 Trunk Road.

In addition consideration has been given to any new transport infrastructure or developments which have the potential to impact on air quality within the District.

Some new developments have been identified since the 2012 Updating and Screening Assessment:

- Work has commenced on new transport infrastructure as reported in the 2013 Air Quality Progress Report¹⁷. No relevant exposure has been identified, therefore no additional monitoring has been undertaken.
- A newly identified site in Richmond town centre comprising narrow congested streets, road junctions and properties close to the curb will be subject to monitoring in 2014.
- New biomass boilers have been identified. A desk study was undertaken on the largest and concluded that there was no need to proceed to a Detailed Assessment for PM₁₀ or NO₂ for this location.

It is concluded that there are no likely exceedances of any of the Air Quality Objectives for any of the key pollutants.

The report concludes that there is no requirement to proceed to a Detailed Assessment for any of the named pollutants within the Richmondshire District area.

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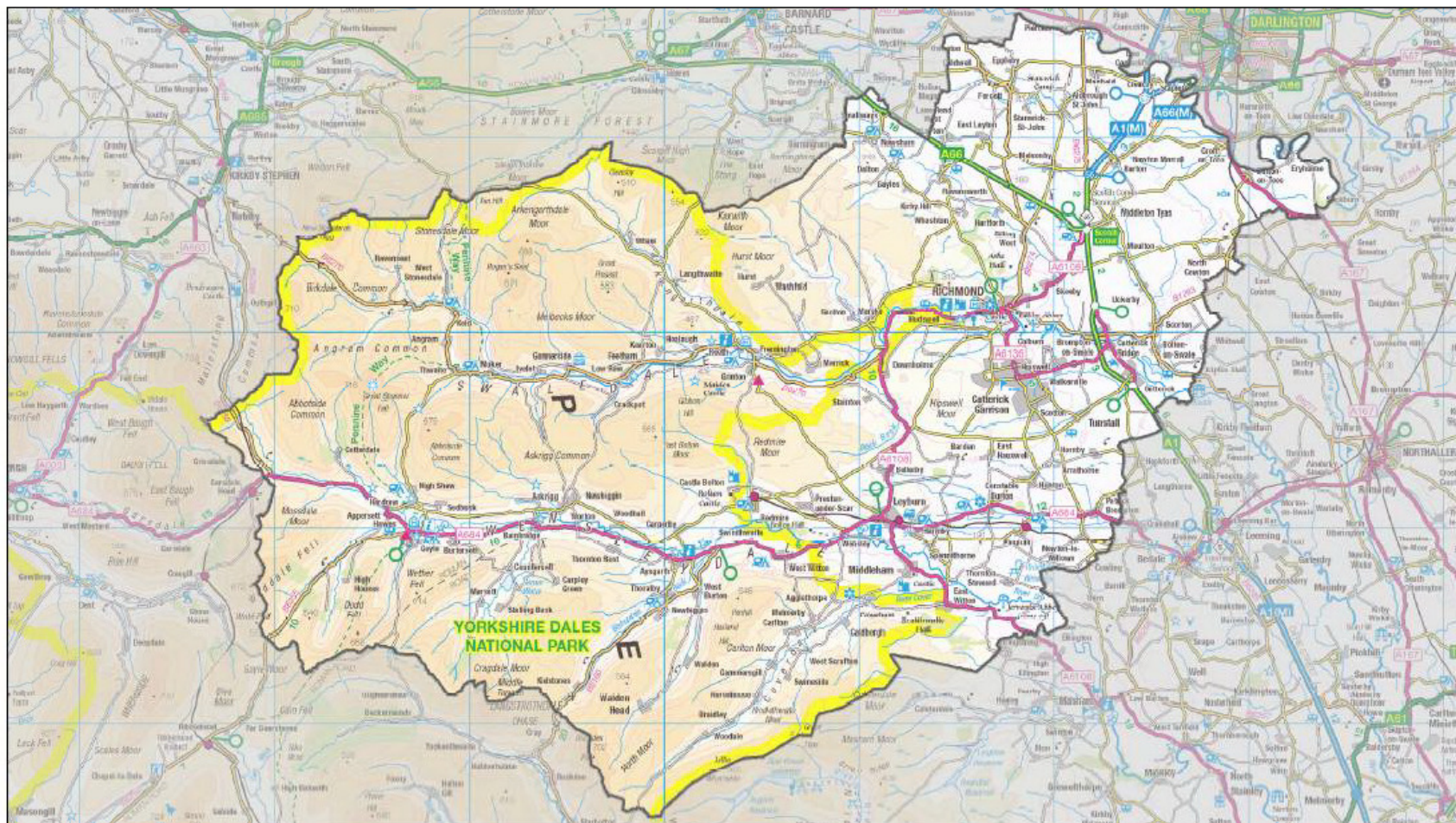
1 Introduction

1.1 Description of Local Authority Area

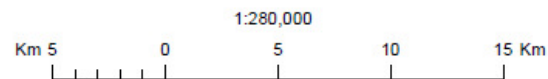
The District of Richmondshire (Figure 1) is part of the County of North Yorkshire and covers a total of 509 square miles (1318 square kilometres). The western part of the District is located within the Yorkshire Dales National Park. The Pennines run in a north/south direction through this area with two of the larger Dales, Wensleydale and Swaledale, dominating the area. The eastern part of the district is less hilly and lower lying.

The District is predominantly rural in nature with a population of approximately 53000 inhabitants. The main settlements are in Richmond and Catterick Garrison (which includes the main Catterick Garrison military base). The rest of the population is distributed widely across the area including the small market towns of Leyburn and Hawes and several larger villages including Barton, Brompton-on-Swale and Catterick Village.

Industry is limited to quarry processes and light industrial activities. The main source of emissions to air is from road transport. The A1/ A1(M) and A66 trunk routes pass through the eastern part of the District.




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Figure 1 The District of Richmondshire

1.2 Purpose of Progress Report

This report fulfils the requirements of the Local Air Quality Management (LAQM) 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.

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 LAQM 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 LAQM in England are set out in the Air Quality (England) Regulations 2000 (SI 928), The Air Quality (England) (Amendment) Regulations 2002 (SI 3043), and are shown in Table 1.1. This table shows the objectives in units of microgrammes per cubic metre $\mu\text{g}/\text{m}^3$ (milligrammes per cubic metre, 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 µg/m ³	Running annual mean	31.12.2003
	5.00 µg/m ³	Annual mean	31.12.2010
1,3-Butadiene	2.25 µg/m ³	Running annual mean	31.12.2003
Carbon monoxide	10 mg/m ³	Running 8-hour mean	31.12.2003
Lead	0.50 µg/m ³	Annual mean	31.12.2004
	0.25 µg/m ³	Annual mean	31.12.2008
Nitrogen dioxide	200 µg/m ³ not to be exceeded more than 18 times a year	1-hour mean	31.12.2005
	40 µg/m ³	Annual mean	31.12.2005
Particulate Matter (PM ₁₀) (gravimetric)	50 µg/m ³ , not to be exceeded more than 35 times a year	24-hour mean	31.12.2004
	40 µg/m ³	Annual mean	31.12.2004
Sulphur dioxide	350 µg/m ³ , not to be exceeded more than 24 times a year	1-hour mean	31.12.2004
	125 µg/m ³ , not to be exceeded more than 3 times a year	24-hour mean	31.12.2004
	266 µg/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

Round One

Stage 1 of the Review and Assessment¹ undertaken in 1999 concluded 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 PM₁₀ required further investigation.

The Stage 2 report² included short-term monitoring data from a number of worst-case locations. These showed that exceedances of the carbon monoxide, nitrogen dioxide and PM₁₀ 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.

Round Two

The second round Updating and Screening Assessment (USA)³ 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 Assessment⁴ concluded that no further action was required for sulphur dioxide.

The 2005 progress report⁵ 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.

Round Three

The third round of Review and Assessment was undertaken in 2006 commencing with a further Updating and Screening Assessment (USA)⁶. This concluded that there was no likelihood of exceedances of any of the air quality objectives.

The 2007 Progress Report⁷ similarly concluded that there was no likelihood of the exceedance of any of the air quality objectives. However, following the upgrading of the A66 Trunk Road, as a precaution, nitrogen dioxide diffusion tubes were placed at strategic locations within the District to ascertain whether the carriageway upgrading had caused an exceedance of the nitrogen dioxide air quality objectives. The diffusion tubes were exposed monthly for a period of 12 months, however, it was concluded that there was no likelihood of exceedance of the annual mean nitrogen dioxide.

The 2008 Progress Report⁸ also confirmed that there was no likelihood of an exceedance of any of the air quality objectives but it was recognised that work to upgrade the A1 from a two lane to a three lane carriageway within the District was imminent, with an estimated completion date during 2010.

Reports from the third round Review and Assessment are summarised in Table 1.4.3.

Round Four

The fourth round Updating and Screening Assessment (2009)⁹ 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 PM₁₀, 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 (PM₁₀ 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 exceedances of any of the national Air Quality Strategy pollutant objectives but that the ongoing nitrogen dioxide diffusion tube monitoring should continue.

The 2010 Progress Report¹⁰ concluded that no action was required for any of the National Air Quality Strategy pollutants listed in table 1.1 above.

The 2011 Progress Report¹¹ concluded that *'Nitrogen dioxide monitoring in Richmond town centre and along the A66 trunk road has confirmed that there are no exceedances of the Air Quality Objectives for this pollutant.'*

A summary of the fourth round Review and Assessment undertaken is presented in Table 1.4.4.

Round Five

The fifth round Updating and Screening Assessment (2012)¹² included details of a biomass combustion process which had been reported on in the previous USA(2009)⁹. The process had previously gone through a screening assessment and it had been concluded that it was unnecessary to proceed to a Detailed Assessment for this process.

The overall conclusion of the USA (2012) was that as there had been no exceedances of the current annual mean objective (and there did not appear to be any likelihood of future exceedances from the assessment of new sources and changes to existing sources), there was no need to proceed to a Detailed Assessment in any area and that no further action was required other than to continue monitoring for the purposes of Review and Assessment.

The 2013 Progress Report¹⁷ concluded that:

- There are no likely exceedances of any of the Air Quality Objectives for any of the key pollutants.

- There is no requirement to proceed to a Detailed Assessment for any of the named pollutants within the Richmondshire District area.

A summary of the fifth round Review and Assessment undertaken to date is presented in Table 1.4.5.

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 exceedances 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 exceedances 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 dual carriageway. A 12-month diffusion tube monitoring campaign along its length will determine whether there are any exceedances of the annual objective.
Appraisal Summary	Conclusions accepted for all pollutants.

Progress Report	April 2008
All pollutants	No exceedances 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 exceedances 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 exceedances 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 exceedances 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 1.4.5 Summary of the Fifth Round of Review and Assessment

USA	April 2012
All pollutants	<i>'As there have been no exceedances of the current annual mean objective and there does not appear to be any likelihood of future exceedances, no further action is required other than to continue monitoring for the purposes of Review and Assessment.'</i> USA(2012) ¹²
Appraisal Summary	Conclusions accepted for all sources and pollutants.

Progress Report	May 2013
All pollutants	<i>'It is concluded that there are no likely exceedances of any of the Air Quality Objectives for any of the key pollutants. The report concludes that there is no requirement to proceed to a Detailed Assessment for any of the named pollutants within the Richmondshire District area.'</i>
Appraisal Summary	Conclusions accepted for all pollutants. Defra recommend that, in light of the upgrading of the A1 (2-lane) to a 3 lane motorway due to commence in 2013, additional monitoring should be considered as a prioritised action, particularly if there is relevant exposure identified.

2 New Monitoring Data

2.1 Summary of Monitoring Undertaken

2.1.1 Automatic Monitoring Sites

Richmondshire District Council (RDC) does not have an automatic monitoring station located in the District. RDC does however currently manage (under a service level agreement) the automatic monitoring station in Northallerton which lies in Hambleton District.

2.1.2 Non-Automatic Monitoring Sites

In Richmondshire 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. They are examined separately below:

Richmond Town Centre

Nitrogen dioxide (NO₂) 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 NO₂ levels and assist with the process of local air quality management. The location of these tubes is shown on the map at Figure 2.1. Table 2.1 below summarises the location and exposure for the tubes in Richmond town centre.

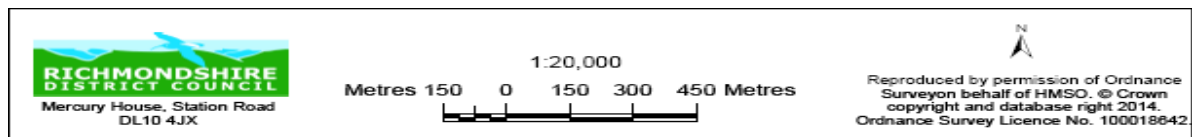
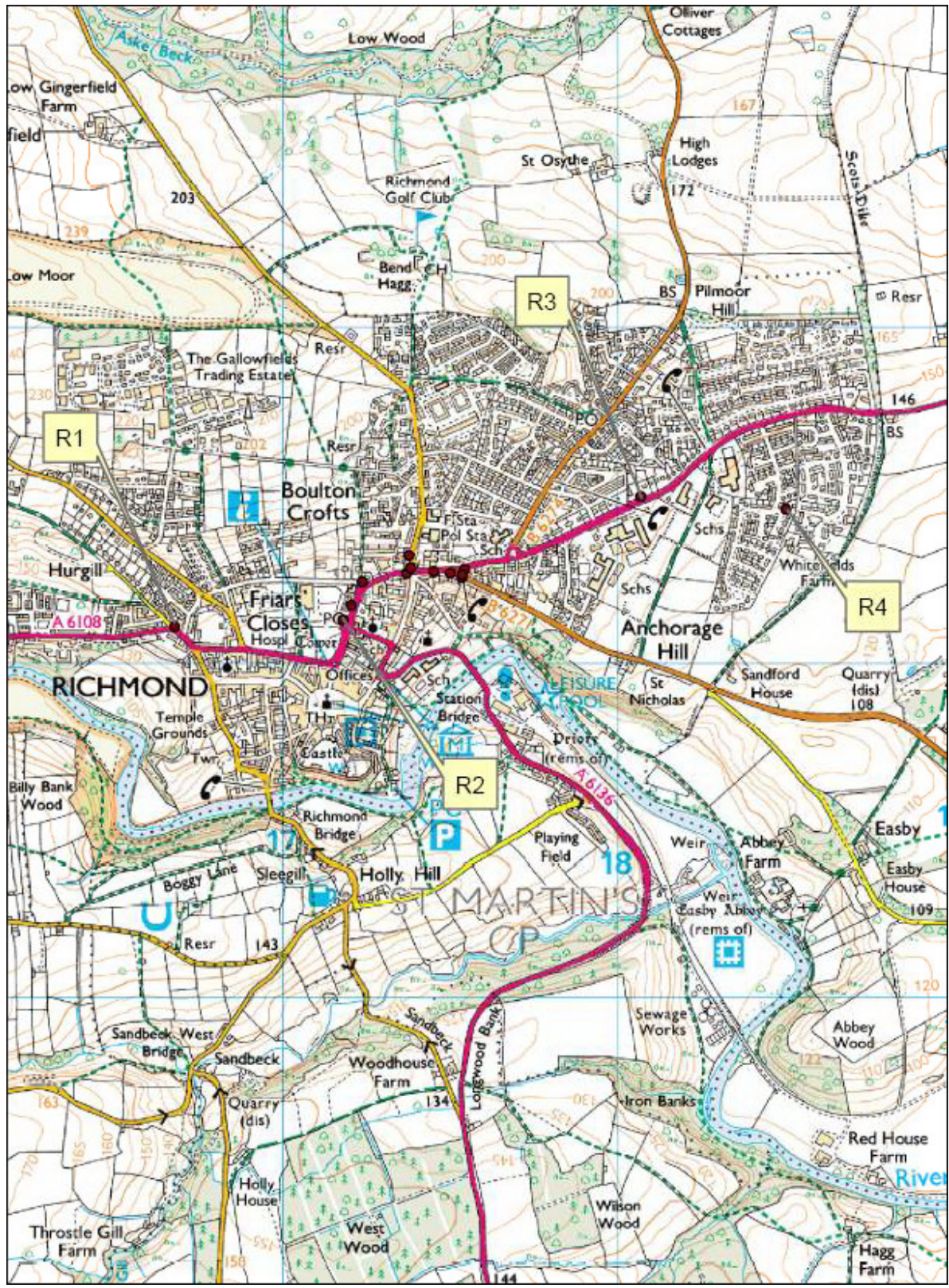


Figure 2.1 Map of Non-Automatic Monitoring Sites in Richmond Town Centre

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

Site ID	Site Name	Site Type	X OS Grid Reference	Y OS Grid Reference	Site Height (approx m)	Pollutants Monitored	In AQMA?	Is Monitoring Co-located with a Continuous Analyser (Y/N)	Relevant Exposure? (Y/N with distance (m) from monitoring site to relevant exposure)	Distance to Kerb of Nearest Road (m)	Does this Location Represent Worst-Case Exposure?
R1	Victoria Road	Roadside	416688	501097	3	NO ₂	N	N	Y (0.5m)	2m	Y
R2	Queens Road	Roadside	417180	501125	3	NO ₂	N	N	Y (8m)	2m	Y
R3	Darlington Road	Roadside	418066	501490	3	NO ₂	N	N	Y (22m)	1m	Y
R4	White Rose Crescent	Urban Background	418504	501455	3	NO ₂	N	N	Y (11m)	2m	Y

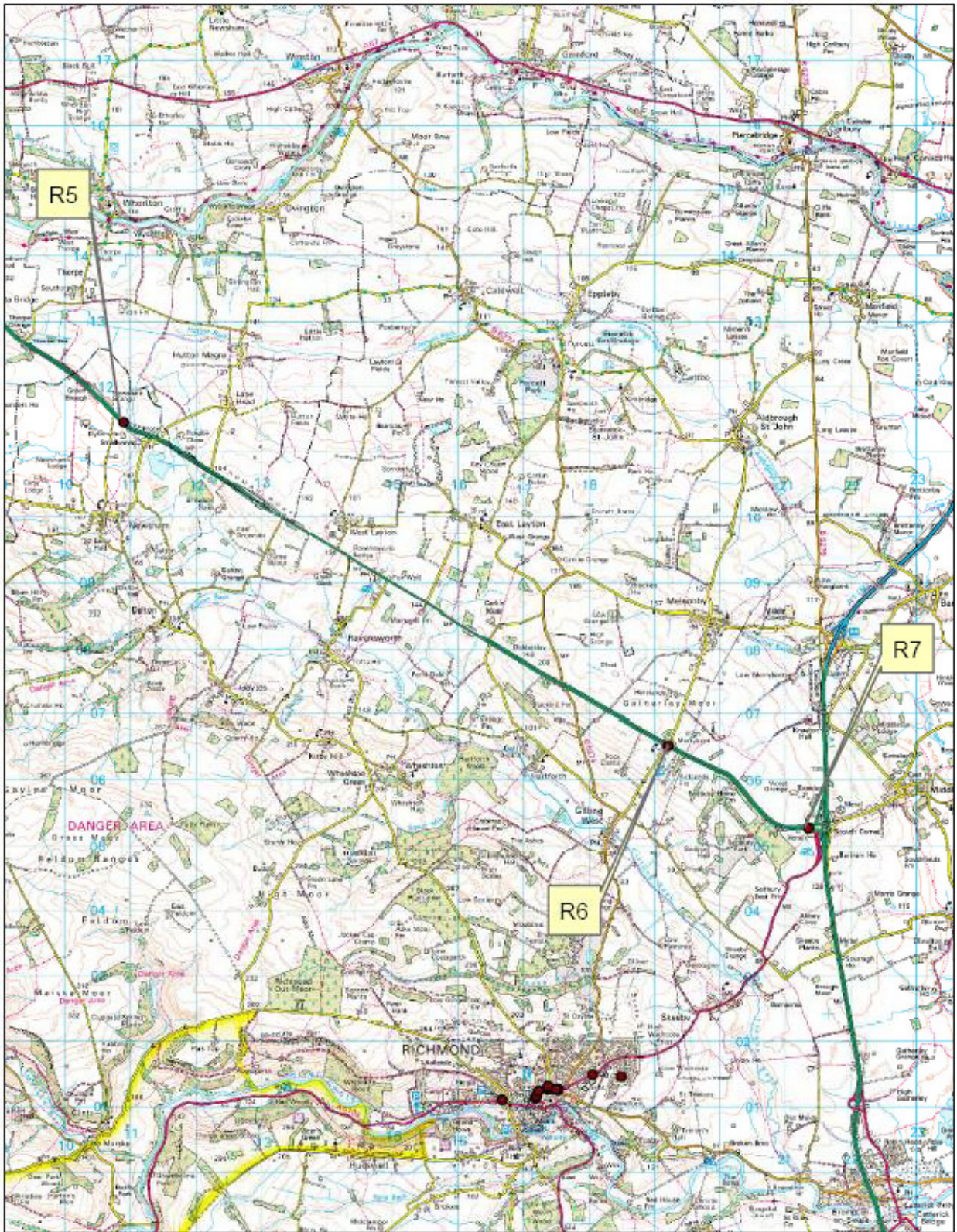
A66 Trunk Road


The purpose of the nitrogen dioxide diffusion tube monitoring along the A66 Trunk Road is to assess the potential for an exceedance 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. A map of these locations is shown in Figure 2.2. Details of these locations are shown in Table 2.2. All are fixed at the facades of the buildings and are therefore relevant exposures.

Following advice from the 2009 USA, monitoring was then continued from 30 September 2009 to date.

NB One of the locations, R5 Grove House, will not be used as a site for a diffusion tube beyond 2013 due to no longer being able to gain access the property facade.




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Figure 2.2 Location of Diffusion Tubes along the A66 Trunk Road

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

Site ID	Site Name	Site Type	X OS Grid Reference	Y OS Grid Reference	Site Height (approx m)	Pollutants Monitored	In AQMA?	Is Monitoring Co-located with a Continuous Analyser (Y/N)	Relevant Exposure? (Y/N with distance (m) from monitoring site to relevant exposure)	Distance to Kerb of Nearest Road (m)	Does this Location Represent Worst-Case Exposure?
R5	Grove House	Roadside	410902	511462	2	NO ₂	N	N	Y (0m)	9m	Y
R6	Gatherley Moor Farm	Roadside	419207	506509	2	NO ₂	N	N	Y (0m)	8m	Y
R7	Scotch Corner Hotel	Roadside	421366	505261	3	NO ₂	N	N	Y (0m)	22m	Y

Quality Assurance/Quality Control (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 a participant of the Workplace Analysis Scheme for Proficiency (WASP). The tubes contain a mesh which is doped with 50% v/v triethanolamine (TEA) and acetone. They are exposed according to the monthly schedule supplied by AEA Energy and Environment.

Until the 31 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.¹⁰

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

Supplier:	Environmental Scientifics Group
Analyst:	Environmental Scientifics Group
Preparation Method:	Dipping method
Type of tube:	Natural polypropylene
Type of cap:	Blue end cap of LDPE (Low Density Polyethylene) within which are two stainless steel grids coated in an absorbent
Type of absorbent:	50% triethanolamine : 50% acetone
Participant of the Workplace Analysis Scheme for Proficiency (WASP):	Yes
Current WASP Rating:	Satisfactory
Method accreditation:	UKAS
Conforms to 'Diffusion Tubes for Ambient NO ₂ Monitoring: Practical Guidance':	Yes

The ESG laboratory conforms to the Harmonisation Practical Guidance 'Diffusion Tubes for Ambient NO₂ Monitoring: Practical Guidance for Laboratories and Users'¹⁸. The laboratory is rated the top rating of 'Satisfactory' under the Workplace Analysis Scheme for Proficiency (WASP) performance criteria set by the Health and Safety Laboratory¹³.

It is known that there are systematic differences in the performance of different laboratories and preparation methods of diffusion tubes. A spreadsheet (Version Number 03/14) provided by the LAQM Helpdesk (which can be viewed at http://laqm.defra.gov.uk/documents/Database_Diffusion_Tube_Bias_Factors-v03_14-Final-v2.xls) 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 chemiluminescence monitors, where data has been collected for 9 months or more.

For ESG Didcot and for a particular tube type (ie the same type as used in Richmondshire) there were 28 co-location studies. For this group an overall bias adjustment factor of 0.80 was reported. A copy of the relevant section of the table provided by the LAQM Helpdesk is shown in Table 2.4 below.

Table 2.4 National Diffusion Tube Bias Adjustment Factor Spreadsheet Version 03/14 (Analysis at ESG Didcot with 50%TEA in acetone – 28 studies)

National Diffusion Tube Bias Adjustment Factor Spreadsheet						Spreadsheet Version Number: 03/14					
<p>Follow the steps below in the correct order to show the results of relevant co-location studies</p> <p>Data only apply to tubes exposed monthly and are not suitable for correcting individual short-term monitoring periods</p> <p>Whenever presenting adjusted data, you should state the adjustment factor used and the version of the spreadsheet</p> <p>This spreadsheet will be updated every few months; the factors may therefore be subject to change. This should not discourage their immediate use.</p>						<p>This spreadsheet will be updated at the end of June 2014</p> <p>LAQM Helpdesk Website</p>					
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 ² shown in blue at the foot of the final column.					
If a laboratory is not chosen, we have no data for this laboratory.		If a preparation method is not chosen, we have no data for this method at this laboratory.		If a year is not chosen, we have no data.		If you have your own co-location study then see footnote ² . 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	Year ²	Site Type	Local Authority	Length of Study (months)	Diffusion Tube Mean Conc. (Dm) ($\mu\text{g}/\text{m}^3$)	Automatic Monitor Mean Conc. (Cm) ($\mu\text{g}/\text{m}^3$)	Bias (B)	Tube Precision ³	Bias Adjustment Factor (A) (Cm/Dm)	
ESG Didcot	50% TEA in acetone	2013	B	Gravesham Borough Council	11	33	32	4.8%	G	0.95	
ESG Didcot	50% TEA in acetone	2013	B	Gravesham Borough Council	12	44	32	39.8%	G	0.72	
ESG Didcot	50% TEA in acetone	2013	R	Falkirk Council	12	35	31	14.2%	G	0.88	
ESG Didcot	50% TEA in acetone	2013	UB	Falkirk Council	12	25	20	22.7%	G	0.81	
ESG Didcot	50% TEA in acetone	2013	B	Pembrokeshire Council	12	7	6	17.3%	P	0.85	
ESG Didcot	50% TEA in acetone	2013	UB	Medway	12	24	25	-3.5%	G	1.04	
ESG Didcot	50% TEA in acetone	2013	R	Medway Council	10	36	27	36.5%	G	0.73	
ESG Didcot	50% TEA in acetone	2013	B	Medway	11	26	14	84.9%	P	0.54	
ESG Didcot	50% TEA in acetone	2013	R	Wrexham County Borough Council	12	23	22	8.3%	G	0.92	
ESG Didcot	50% TEA in acetone	2013	UI	Stockton on Tees	12	27	20	38.0%	G	0.72	
ESG Didcot	50% TEA in acetone	2013	R	Stockton on Tees	12	21	16	30.5%	G	0.77	
ESG Didcot	50% TEA in acetone	2013	SU	Thanet District Council	11	21	16	29.5%	P	0.77	
ESG Didcot	50% TEA in acetone	2013	R	Thanet District Council	11	29	24	17.9%	P	0.85	
ESG Didcot	50% TEA in acetone	2013	R	Cambridge City Council	12	46	35	33.3%	G	0.75	
ESG Didcot	50% TEA in acetone	2013	R	Swale Borough Council	10	45	41	9.3%	G	0.91	
ESG Didcot	50% TEA in acetone	2013	R	Swale Borough Council	12	40	34	16.0%	P	0.86	
ESG Didcot	50% TEA in acetone	2013	R	Swale Borough Council	12	41	40	4.0%	G	0.96	
ESG Didcot	50% TEA in acetone	2013	R	Swale Borough Council	11	53	34	54.8%	G	0.65	
ESG Didcot	50% TEA in acetone	2013	R	North East Lincolnshire Council	11	59	49	19.5%	G	0.84	
ESG Didcot	50% TEA in acetone	2013	R	North East Lincolnshire Council	11	34	30	12.3%	G	0.89	
ESG Didcot	50% TEA in acetone	2013	R	North East Lincolnshire Council	11	40	31	26.9%	G	0.79	
ESG Didcot	50% TEA in acetone	2013	R	Rugby Borough Council	12	26	22	16.6%	P	0.86	
ESG Didcot	50% TEA in acetone	2013	KS	Marlyebone Road Intercomparison	12	109	81	34.8%	G	0.74	
ESG Didcot	50% TEA in acetone	2013	UB	City of York Council	11	25	19	29.7%	G	0.77	
ESG Didcot	50% TEA in acetone	2013	R	City of York Council	12	40	28	41.2%	G	0.71	
ESG Didcot	50% TEA in acetone	2013	R	City of York Council	12	34	24	38.0%	G	0.72	
ESG Didcot	50% TEA in acetone	2013	R	City of York Council	10	40	31	28.3%	G	0.78	
ESG Didcot	50% TEA in acetone	2013	KS	Suffolk Coastal District Council	11	46	41	11.8%	G	0.89	
ESG Didcot	50% TEA in acetone	2013		Overall Factor² (28 studies)				Use		0.80	

Richmondshire District Council provides Environmental Services to Hambleton District Council. All of the Richmondshire and Hambleton diffusion tubes are collected and processed together. Three of the diffusion tubes are co-located with an Automatic Monitoring Site situated in Northallerton (in Hambleton District). The bias adjustment factor for these tubes has been calculated as 0.79 (the bias adjustment calculations will be available in the 2014 Air Quality Progress Report for Hambleton District Council once it is published).

As the figure applied to the co-located Hambleton tubes of 0.79 is very similar to the overall bias adjustment factor of 0.80 (as detailed above) then it has been deemed appropriate to use the bias adjustment factor produced by the site located in Northallerton. Additionally the use of this figure does not significantly affect the end results as they fall all well under the annual mean objective for nitrogen dioxide ($40 \mu\text{g}/\text{m}^3$).

This figure of **0.79** has therefore been applied (multiplied) to the 2013 diffusion tube results for Richmondshire.

2.2 Comparison of Monitoring Results with Air Quality Objectives

2.2.1 Nitrogen Dioxide (NO₂)

Diffusion Tube Monitoring Data

The monitoring data for the seven nitrogen dioxide diffusion tubes for Richmondshire in 2013 is shown in Table 2.5.

The full set of data for the tubes for 2013 is included in Appendix A.

The monitoring data for the seven nitrogen dioxide diffusion tubes for Richmondshire from 2008 to 2013 is shown in Table 2.6, and illustrated in a graph in Figure 2.3.

Table 2.5 Results of NO₂ Diffusion Tubes in Richmondshire 2013

Site ID	Location	Site Type	Within AQMA?	Triplicate or Co-located Tube	Full Calendar Year Data Capture 2013 (Number of Months)	2013 Annual Mean Concentration (µg/m ³) - Bias Adjustment factor = 0.79
R1	Victoria Road	Roadside	N	N	11	18.2
R2	Queens Road	Roadside	N	N	12	25.0
R3	Darlington Road	Roadside	N	N	12	17.3
R4	White Rose Crescent	Urban Background	N	N	12	9.1
R5	Grove House	Roadside	N	N	11	13.7
R6	Gatherley Moor Farm	Roadside	N	N	12	24.5
R7	Scotch Corner Hotel	Roadside	N	N	12	19.7

Table 2.6 Results of NO₂ Diffusion Tubes (2008 to 2013)

Site ID	Site Type	Within AQMA?	Annual Mean Concentration (µg/m ³) - Adjusted for Bias ^a					
			2008 (Bias Adjustment Factor = 0.76)	2009 (Bias Adjustment Factor = 0.76)	2010 (Bias Adjustment Factor = 0.85)	2011 (Bias Adjustment Factor = 0.84)	2012 (Bias Adjustment Factor = 0.75)	2013 (Bias Adjustment Factor = 0.79)
R1	Roadside	N	20	19.0	21.7	19	18.3	18.2
R2	Roadside	N	23	24.6	28.3	25	26.3	25.0
R3	Roadside	N	16	16.4	24.7	19	17.2	17.3
R4	Urban Background	N	9	10.9	10.7	9	9.4	9.1
R5	Roadside	N	24	18.3 [†]	28.7	24	20.5	13.7
R6	Roadside	N	17	15.7 [†]	16.6	14	18.3	24.5
R7	Roadside	N	21	21.4 [†]	21.8	19	19.1	19.7

[†] Annualised Means – see 2010 Progress Report.¹⁰

Figure 2.3 Trends in Annual Average NO₂ Concentrations in Richmondshire 2008 to 2013 (bias-adjusted)

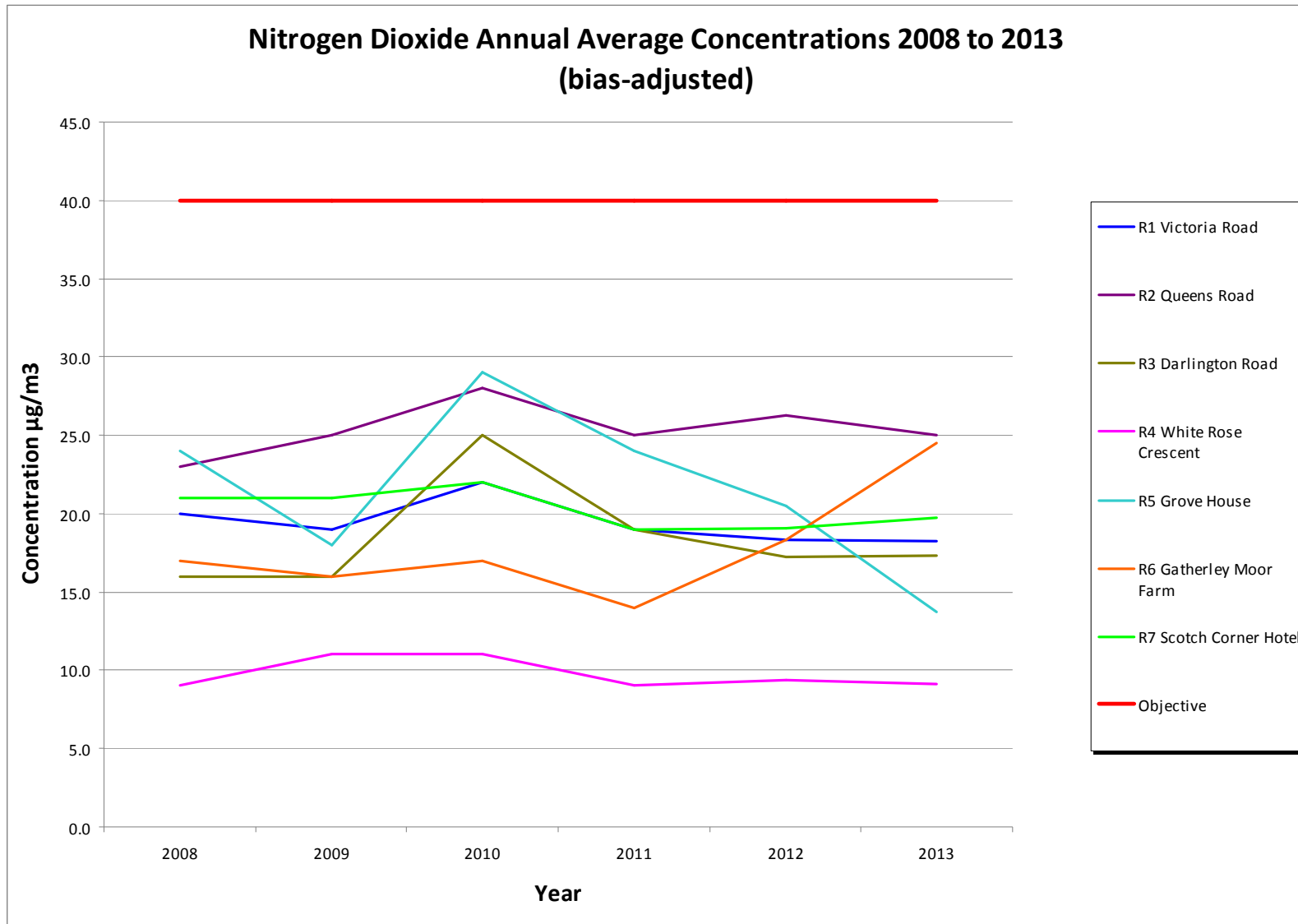


Table 2.5 / Figure 2.3 have been assessed and the following observations made:

- In 2010 all of the figures showed a slight rise in nitrogen dioxide concentrations. The Defra LAQM web pages (<http://laqm.defra.gov.uk/review-and-assessment/tools/background-maps.html>) report that *'it is now widely recognised that'*.... there were.... *'high NO₂ concentrations during 2010'*....

Looking at the figures before and after 2010 the following observations can be made:

- The general trend of the nitrogen dioxide concentrations at the roadside sites within Richmond (R1-3) was for the levels detected to remain fairly steady over the time period 2008 to 2013. During that period all of the roadside levels fell between 16 and 28 µg/m³.
- The nitrogen dioxide concentrations at the urban background site in Richmond (R4) have remained consistently low at around 10 µg/m³.
- There were differences between results from the individual sites situated along the A66 (R5-7). These are detailed separately below.
- The roadside site Grove House (R5) is adjacent to a dual carriageway section the A66. The nitrogen dioxide concentrations at this site appeared to be generally reducing over the time period including the last two years. NB After the end of 2013 this site will no longer be used as a location for diffusion tube monitoring.
- The roadside site at Gatherley Moor Farm (R6) is on a corner where a minor road junction meets, at the crest of a hill, a dual carriageway section of the A66. The nitrogen dioxide concentrations at this site remained fairly steady over the time period 2008 to 2011 but with levels detected rising over the last two years. There have been no physical changes to the layout of this junction which could explain this recent increase. Changes to weather conditions or traffic volumes may have contributed to this recent change.
- The roadside site at the Scotch Corner Hotel (R7) is adjacent to the A66/A1 roundabout. The nitrogen dioxide concentrations remained fairly steady over the time period 2008 to 2013. The levels detected were similar to those detected at the roadside sites in Richmond town centre (R1-3).

All concentrations are below the Annual Mean Air Quality Objective of 40µg/m³.

Research referred to in the Local Air Quality Management Technical Guidance¹⁹ has shown that where the Annual Mean nitrogen dioxide concentration is less than 60µg/m³ an exceedance 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 confidence that the **1-hour mean Air Quality Objective for nitrogen dioxide is unlikely to be exceeded.**

2.2.2 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 New Local Developments

There have been some new local developments in the District since the publication of the 2012 Updating and Screening Assessment as detailed below.

3.1 Road Traffic Sources

A1(M) Upgrade – update – under construction

The 2013 Progress Report¹⁷ referred to proposed road developments (involving the upgrade of the A1 from a 2 lane road to a 3-lane motorway A1(M) between Leeming Bar which is south of the District and Barton in the north of the District). The upgrading includes new junctions and a service road which would run parallel to the motorway. These developments commenced in 2013. The project is due to be completed in Spring 2017.

RDC was advised by Defra as part of the acceptance of the findings of the 2013 Progress Report¹⁷ that as a consequence of the developments to upgrade the A1(M) additional monitoring should be considered as a prioritised action, particularly if there is relevant exposure identified. These developments have been considered and no relevant exposure has been identified at this stage, therefore no additional monitoring has been undertaken as a consequence of these developments.

Richmond – newly identified site comprising narrow congested streets, road junctions and properties close to the kerb

A road junction section in Richmond, though not new, has however been identified as having the potential for high levels of relevant exposure. The site comprises a busy section of road with merging roads, steep inclines, traffic lights and tends to result in standing traffic. The section forms the main route through the town and leading on to an Industrial Estate to the north of the town. There is relevant exposure as residential properties are close to the kerb on both sides of the road. This site will form part of an initially short-term diffusion tube monitoring project which will be reported on at the next Updating and Screening Assessment due in 2015 as appropriate.

3.2 Other Transport Sources

There have been no significant new other transport sources in the District since the publication of the 2012 Updating and Screening Assessment.

3.3 Industrial Sources

There have been no significant new industrial sources in the District since the publication of the 2012 Updating and Screening Assessment.

3.4 Commercial and Domestic Sources

Solid Fuel Appliances

Information obtained from the North Yorkshire Building Control Partnership database for the Richmondshire area indicated that there were 118 notifications of solid fuel burning appliances in 2013. The notifications were from HETAS (the official body recognised by Government to approve biomass and solid fuel domestic heating appliances, fuels and services including the registration of competent installers). It is not known how many of these are specifically biomass boilers.

Given the size of Richmondshire (over 1318 km²) it is extremely unlikely that there are any exceedances of the PM₁₀ objectives based on the density of such appliances in a 500x500m square (there are over 5272 of these squares in Richmondshire).

Therefore it is deemed that there is no requirement to proceed to a Detailed Assessment for PM₁₀ for any location.

Biomass Boilers – planning permissions

One premises (commercial) received planning permission in 2013 for a biomass boiler (greater than 0.4 megawatts (MW)) to heat a poultry farm in a rural location near Forcett. This installation will be permitted by the Environment Agency (as part of

the poultry farm environmental permit) under the Environmental Permitting (England and Wales) Regulations 2010 (as amended) if required.

One premises (a military Barracks) to the south of Catterick village has recently had two biomass boilers (0.6 MW and 1 MW) installed. This premises does not require a permit under the above regulations as 100% virgin woodchip is burnt.

Five premises (domestic and commercial) were given planning permission by the Yorkshire Dales National Park planning authority in 2013 to build smaller scale biomass boilers (than those above). The locations are: Bainbridge; Hawes; Sedbusk; Askrigg and Melmerby.

Biomass combustion – individual installation

The largest of the biomass installations, reported above, has been considered as a desktop exercise following guidance in LAQM.TG(09)¹⁹, in order to assess whether or not the council needed to proceed to a Detailed Assessment for that location.

Information was obtained from various sources and compiled as follows (refer to calculations in Appendix B):

- 1 Measured emission for each appliance.
- 2 Estimated PM₁₀ and NO_x emission rates for each appliance.
- 3 “Background-adjusted” emission rates for each appliance. Location in a 500 x 500m centred on Grid reference 424500 497500.
- 4 “Threshold emission” rates for PM₁₀, NO₂ annual mean and NO₂ 1-hour mean were taken from nonograms (based on known stack height and diameter).

The guidance (LAQM.TG(09))¹⁹ states that *‘If the “background-adjusted” emission rate is greater than or equal to the threshold emission rate, the authority will need to proceed to a Detailed Assessment.’*

The “background-adjusted” emission rates for the two boilers (when assessed singly and when combined) were, for:

- (i) PM₁₀
- (ii) NO₂ annual mean; and
- (iii) NO₂ 1-hour mean

all less than the “threshold emission” rates.

Therefore there is no need to proceed to a Detailed Assessment for PM₁₀ or NO₂ for this area.

As this exercise was conducted on the largest of the boilers (worst-case scenario) it is considered that, based on the findings, no further individual assessments would be required on the other biomass boilers declared in 2013.

3.5 New Developments with Fugitive or Uncontrolled Sources

There have been no significant new fugitive or uncontrolled sources in the District since the publication of the 2012 Updating and Screening Assessment.

Richmondshire District 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.

Richmondshire District Council confirms that all the following have been considered:

- **Other transport sources**
- **Industrial sources**
- **Commercial and domestic sources**
- **New developments with fugitive or uncontrolled sources.**

Richmondshire District Council has identified the following new or previously unidentified local developments which may impact on air quality in the Local Authority area.

- **Road traffic sources**

Newly identified site comprising narrow congested streets, road junctions and properties close to the kerb in Richmond. The site will be subject to a diffusion tube monitoring project in 2014 (initially short-term).

These will be taken into consideration in the next Updating and Screening Assessment

4 Local / Regional Air Quality Strategy

Richmondshire District Council does not have a specific local air quality strategy at present. The published Local Plan Core Strategy¹⁵ (see Table 4) contains policies that address the impact of development on air quality.

Table 4 Brief overview of the status and remit of the Local Plan Core Strategy¹⁵

On the 28th of February 2013, Richmondshire District Council submitted the Richmondshire Local Plan: Core Strategy to the Secretary of State for formal examination by the Planning Inspectorate. The formal examinations took place in February 2014 and the Council is preparing to consult on changes arising from those hearings.

The document proposes key policies for managing growth and change across the District to 2028. Once adopted it will form part of the Development Plan for the District which will:

- Set out the amount of new housing, retail and employment development that will take place in different parts of the District;
- Identify the type of development required to meet the needs of the local communities;
- Outline the types of changes that will happen within the plan area;
- List some of the projects and investment that will support and deliver the strategy; and
- Provide a framework to assist in the determination of planning applications.

The document covers the area of Richmondshire District outside of the Yorkshire Dales National Park.

5 Planning Applications

Approved applications of 'major' developments in the Richmondshire District Council planning area of the district in 2013 were as follows:

- Plans to develop Catterick Garrison town centre involve improvements to local road junctions (one near the military hospital on Hildyard Road and one on Richmond Road at Gough Road at the entrance to the retail park) and the development of a cinema, hotel, retail units and food and beverage outlets.
- A large residential development in Hipswell received planning permission in 2013 to erect 72 residential dwellings (with associated parking and landscaping).

Approved applications of 'major' developments in the North Yorkshire National Park planning area of the district in 2013 were as follows:

- Zero developments likely to impact on air quality

Pending applications of 'major' developments in the Richmondshire District Council planning area are as follows:

- 25 residential dwellings in Hipswell
- 40 residential dwellings in Hipswell
- 12 houses & 8 apartments in Richmond West
- 130 residential dwellings at Colburn

Pending applications of 'major' developments in the North Yorkshire National Park planning area of the district in 2013 were as follows:

- Zero developments likely to impact on air quality

These developments will be kept under review and will be considered in future Air Quality Updating and Screening Assessments/Progress Reports if necessary.

6 Air Quality Planning Policies

Richmondshire District Council does not have a specific local air quality strategy at present. The published Local Plan Core Strategy¹⁵ (see Table 4) contains some policies which help to address the impact of development on air quality.

7 Local Transport Plans and Strategies

Richmondshire District Council (RDC) is part of a two-tier authority structure and as such does not have control over local transport policy. That responsibility lies with North Yorkshire County Council (NYCC). RDC does however currently provide air quality information to NYCC in the form of copies of the annual Review and Assessment reports. Therefore NYCC are able to use that information to inform local transport plans, the most recent being the third North Yorkshire Local Transport Plan (LTP3)¹⁴ which includes Richmond District.

The LTP3 sets out the aims and objectives for transport in North Yorkshire over the next ten to fifteen years and the strategies and policies to deliver them over the period 2011 to 2016.

It sets out a number of specific objectives of which Environment and Local Economies are most closely linked to air quality. These objectives are adopted in the Local Transport Plan and are shown below:

- Environment and Climate Change – Reducing the impact of transport on the natural and built environment and tackling climate change.
- Local Economies – Supporting flourishing local economies by delivering reliable and efficient transport networks and services. This can be achieved through reducing congestion issues in towns and improving connectivity between major settlements.

LTP3 promotes a hierarchal approach of manage, maintain and improve to deal with transport issues. This approach targets measures to make the best use of the existing network.

LTP3 outlines the County Council's commitment to work with District Councils to identify specific targets for measuring improvements in air quality, particularly in relation to traffic related Air Quality Management Areas (AQMAs). Targets for measuring air quality improvements are mandatory for AQMAs. No AQMAs are declared within the Richmondshire area.

8 Climate Change Strategies

Developments in planning are set out in the Richmondshire Local Plan: Core Strategy¹⁵ (see Table 4). Within this proposed strategy, one of the Core Policies (CP1) is titled 'Responding to Climate Change'. It highlights that the main area that Richmondshire District Council will focus on, in relation to climate change, is in reducing carbon emissions. This will be achieved by looking at the following areas:

- Supporting renewable and low carbon energy generation
- Ensuring Carbon Savings
- Climate Change Adaptation

The NYCC Local Transport Plan (LTP3)¹⁴ (as referred to above in Section 7 of this report) sets out, amongst others, the specific objective of 'Environment and Climate Change' (in Chapter 4 and in greater detail in Appendix 2 within the document).

There are three main purposes of this objective. They are to:

- Contribute towards addressing the problems of climate change.
- Reduce transport related air quality problems.
- Protect the natural and built environment from the impact of transport.

9 Conclusions and Proposed Actions

9.1 Conclusions from New Monitoring Data

Following monitoring of nitrogen dioxide levels in Richmondshire in 2013 (in Richmond town centre and along the A66 trunk road) using diffusion tubes, it is confirmed that there are no exceedances of the Air Quality Objectives for this pollutant.

9.2 Conclusions relating to New Local Developments

Road Traffic

In 2013 work started on the upgrade of the A1 from a 2 lane road to a 3-lane motorway A1(M) between Leeming Bar which is south of the District and Barton in the north of the District), as referred to in the 2013 Progress Report¹⁷.

As advised by Defra, these developments have been considered and no relevant exposure has been identified at this stage, therefore no additional monitoring has been undertaken as a consequence of these developments.

A road junction section in Richmond, though not new, has however been identified as having the potential for high levels at sites with relevant exposure. This site will form part of an initially short-term diffusion tube monitoring project which will be reported on at the next Updating and Screening Assessment due in 2015 as appropriate.

Commercial and domestic sources

118 notifications of solid fuel burning appliances in 2013

Three larger* and five smaller biomass boilers have been either built or given planning permission in 2013 across the district.

* A desk study completed on two of the largest boilers at the same location concluded that there is no need to proceed to a Detailed Assessment for PM₁₀ or NO₂ for this area.

Summary

These developments will be kept under review and will be considered in future Air Quality Updating and Screening Assessments/Progress Reports if this is deemed necessary.

It is concluded that a Detailed Assessment for any of the pollutants is not required.

9.3 Other Conclusions

Richmondshire District Council does not have a specific local air quality strategy at present. The published Local Plan Core Strategy¹⁵ (see Table 4) contains policies that address the impact of development on air quality.

North Yorkshire County Council (NYCC) is the responsible authority in relation to transport. NYCC has published the Local Transport Plan¹⁴ (LTP3) for 2011-2016 which sets out objectives for the areas of 'Environment and climate change' and 'Local economies'.

9.4 Proposed Actions

No Detailed Assessment Required

Given that there are no exceedances of the Air Quality Objectives for nitrogen dioxide across the district it has been concluded that there is no need to continue to a Detailed Assessment for the pollutants nitrogen dioxide or PM₁₀.

Changes in sampling locations

Monitoring will no longer be undertaken at Grove House due to no longer being able to gain access the property facade.

In Richmond an area of narrow and congested streets, with properties close to the kerb has been newly identified. Initially a short-term diffusion tube project has been set up to monitor nitrogen dioxide levels in 2014.

Next course of action

The next course of action for the Council in terms of air quality management will be to submit the 2015 Updating and Screening Assessment.

10 References

- 1 Richmondshire District Council (1999) Stage 1 Air Quality Review and Assessment.
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- 5 Richmondshire District Council (2005)
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- 12 Richmondshire District Council (2012)
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- 13 LAQM Helpdesk – September 2012
Summary of Laboratory Performance in WASP NO₂ Proficiency Testing Scheme for Rounds 111-118.
Reports are prepared by HSL for BV/NPL on behalf of Defra and the Devolved Administrations.
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- 16 Hambleton District Council (2013)
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- 18 AEA Energy and Environment (2008)
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- 19 Department of Environment, Food and Rural Affairs (2009)
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Appendices

Appendix A: Full set of raw diffusion tube data for Richmondshire 2013 – non-bias adjusted.

Appendix B: Emissions Calculations for ‘individual’ biomass combustion source at a military barracks

Appendix A: Full set of raw diffusion tube data for Richmondshire 2013 – non-bias adjusted (in $\mu\text{g}/\text{m}^3$).

Bias adjustments relate to average figures only.

Date	R1 Victoria Road Richmond	R2 Queens Road Richmond	R3 Darlington Road Richmond	R4 White Rose Crescent Richmond	R5 Grove House A66	R6 Gatherley Moor Farm A66	R7 Scotch Corner Hotel A66/A1
Jan-13	32.1	41.1	31.1	19.5	26.8	38.5	30.1
Feb-13	26	32.4	26	14.3	18.4	38.5	29.6
Mar-13	27.8	26.6	27.3	15.5	15.8	26.8	31.8
Apr-13	23.4	27.3	17.8	9.4	14.1	33.2	28
May-13	17.5	26.3	18.2	9.2	14.7	29.7	21.3
Jun-13	17.5	29.9	19.8	7.8	14.8	31.1	24.3
Jul-13	19	30.6	20.7	6.8	14.5	31.4	21.6
Aug-13	2.4*	30.7	14.8	7.1	19.3	28.3	23.6
Sep-13	18.9	32.6	24	11.3	Tube missing	31.9	22
Oct-13	26.5	36.2	23.9	11.9	17.2	35.2	24.8
Nov-13	24	37.4	22.8	13.1	21.6	28.5	21.8
Dec-13	20.3	29.3	16.4	12.8	13.7	19.6	20
Average	23.0	31.7	21.9	11.6	17.4	31.1	24.9
Bias adjusted 0.79	18.2	25.0	17.3	9.1	13.7	24.5	19.7

* Data not used

Appendix B: Emissions Calculations for 'individual' biomass combustion source at a military barracks

Herz BioFire appliances at 600 and 995kW

Measured emission for each appliance

Figures for nominal load using wood chips.

Table 1

	Herz BioFire 600 kW	Herz BioFire 995 kW	Herz BioFire 800 kW #
PM g/GJ	11.25*	18.75*	15 #
NO _x g/GJ	57*	95*	76 #

* Figures estimated based on the 'Non-domestic renewable heat incentive emissions certificate' which applies to the above appliances.

The actual appliance tested for the certification was size 800kW.

Estimated PM₁₀ and NO_x emission rates for each appliance

Emission Rate Formula:

Emission factor in g/GJ x max thermal capacity in kW x 10⁻⁶ = Emission Rate in g/s

Table 2

	Appliance	Calculation	Emission Rate g/s
PM ₁₀	600 kW	11.25 x 600 x 10 ⁻⁶	0.0068
PM ₁₀	995 kW	18.75 x 995 x 10 ⁻⁶	0.0187
NO _x	600 kW	57 x 600 x 10 ⁻⁶	0.0342
NO _x	995 kW	95 x 995 x 10 ⁻⁶	0.0945

PM₁₀ ‘Background adjusted’ emission rates for each appliance (at the location) and ‘Threshold emission rate’

Location (a 500 x 500m centred on Grid reference 424500 497500).

PM₁₀ Background adjusted Rate Formula:

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

Where: E_A = Background adjusted emission rate
 E = Emission rate in g/s (see Table 2 above)
 G = Annual average background concentration in $\mu\text{g}/\text{m}^3$

NB Figure G sourced based on data provided in the 2010 Background Maps supplied via the LAQM website

PM₁₀ Threshold emission rate

Obtained from nonogram Fig 5.19 provided in LAQM.TG(09)¹⁹ using:

Stack height = 9.1m

Stack diameter = 0.3m

Table 3

Appliance	E_A Background-adjusted emission Rate g/s Calculation	E_A Result	Threshold emission rate g/s	Is $E_A \geq$ threshold emission rate?
600 kW	$E_A = \frac{0.0068}{(32 - 14.19852)}$	0.00038	0.004	No
995 kW	$E_A = \frac{0.0187}{(32 - 14.19852)}$	0.00105	0.004	No
E_A Appliances combined		0.00143	0.004	No

NO₂ Annual Mean ‘Background-adjusted’ emission rates for each appliance (at the location) and ‘Threshold emission rate’

Location (a 500 x 500m centred on Grid reference 424500 497500).

NO₂ Background adjusted Rate Formula:

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

Where: E_A = Background-adjusted emission rate
 E = Emission rate in g/s (see Table 2 above)
 G = Annual average background concentration in $\mu\text{g}/\text{m}^3$

NB Figure G sourced based on data provided in the 2010 Background Maps supplied via the LAQM website (No adjustments were made to the figures to adjust for 2010 having higher NO₂ levels than typical years).

NO₂ Threshold emission rate

Obtained from nonogram Fig 5.20 provided in LAQM.TG(09)¹⁹ using:
 Stack height = 9.1m
 Stack diameter = 0.3m

Table 4

Appliance	E_A Background-adjusted emission Rate g/s Calculation	E_A Result	Threshold emission rate g/s	Is $E_A \geq$ threshold emission rate?
600 kW	$E_A = \frac{0.0342}{(40 - 12.1872)}$	0.0012	0.015	No
995 kW	$E_A = \frac{0.0945}{(40 - 12.1872)}$	0.0034	0.015	No
E_A Appliances combined		0.0046	0.015	No

NO₂ 1-hour Mean ‘Background adjusted’ emission rates for each appliance (at the location) and ‘Threshold emission rate’

Location (a 500 x 500m centred on Grid reference 424500 497500).

NO₂ Background adjusted Rate Formula:

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

Where: E_A = Background-adjusted emission rate
 E = Emission rate in g/s (see Table 2 above)
 G = Annual average background concentration in $\mu\text{g}/\text{m}^3$

NB Figure G sourced based on data provided in the 2010 Background Maps supplied via the LAQM website (No adjustments were made to the figures to adjust for 2010 having higher NO₂ levels than typical years).

NO₂ Threshold emission rate

Obtained from nonogram Fig 5.21 provided in LAQM.TG(09)¹⁹ using:

Stack height = 9.1m

Stack diameter = 0.3m

Table 5

Appliance	E_A Background-adjusted emission Rate g/s Calculation	E_A Result	Threshold emission rate g/s	Is $E_A \geq$ threshold emission rate?
600 kW	$E_A = \frac{40 \times 0.0342}{(200 - (2 \times 12.1872))}$	0.0078	0.055	No
995 kW	$E_A = \frac{40 \times 0.0945}{(200 - (2 \times 12.1872))}$	0.0215	0.055	No
E_A Appliances combined		0.0293	0.055	No