



2015 Updating and Screening
Assessment for
Richmondshire District Council

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

May 2015

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Report Reference number	RDC USA 2015
Date	7 May 2015

Executive Summary

This report is the 2015 Updating and Screening Assessment 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 Guidance¹⁸.

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 together with new monitoring undertaken in Richmond which is summarised below:

- **All but one of the concentrations for nitrogen dioxide lie below the Annual Mean Air Quality Objective of 40µg/m³.**
- **The remaining location has a concentration of 40.2 µg/m³ which lies just above the Annual Mean Air Quality Objective of 40µg/m³.**
- **It is stated that the 1-hour mean Air Quality Objective for nitrogen dioxide is unlikely to be exceeded.**

Based on the results of monitoring undertaken in the District there is no need to proceed to a Detailed Assessment.

Additionally particular consideration has been given to the following areas:

- An area of narrow congested streets, road junctions and properties close to the kerb in Richmond was identified as a new area to monitor in the 2014 Progress Report¹⁴.

Monitoring in this area was started in 2014. In light of the results reported in this 2015 USA, it is proposed that monitoring continues in this area in order to help assess whether or not there is a likelihood that the annual mean air quality objective for nitrogen dioxide will not be met in the future.

- New transport infrastructure (which have the potential to impact on air quality within the District); specifically the upgrading of the A1(M) from Leeming Bar to Barton with construction of a Local Access Road (LAR). An external report, written to consider impacts of the proposed development on air quality, was assessed. The report did not predict any exceedances of the air quality objectives for annual mean NO₂ concentrations or annual mean PM₁₀ concentrations for the two identified receptors in this area.
- Biomass boilers granted planning permission. A desk study was undertaken on the largest boilers as part of the 2014 Progress Report. This concluded that there 'is no need to proceed to a Detailed Assessment for PM₁₀ or NO₂ for this area'. This assessment remains valid.

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Appendix A Quality Assurance / Quality Control Data

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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, namely 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.

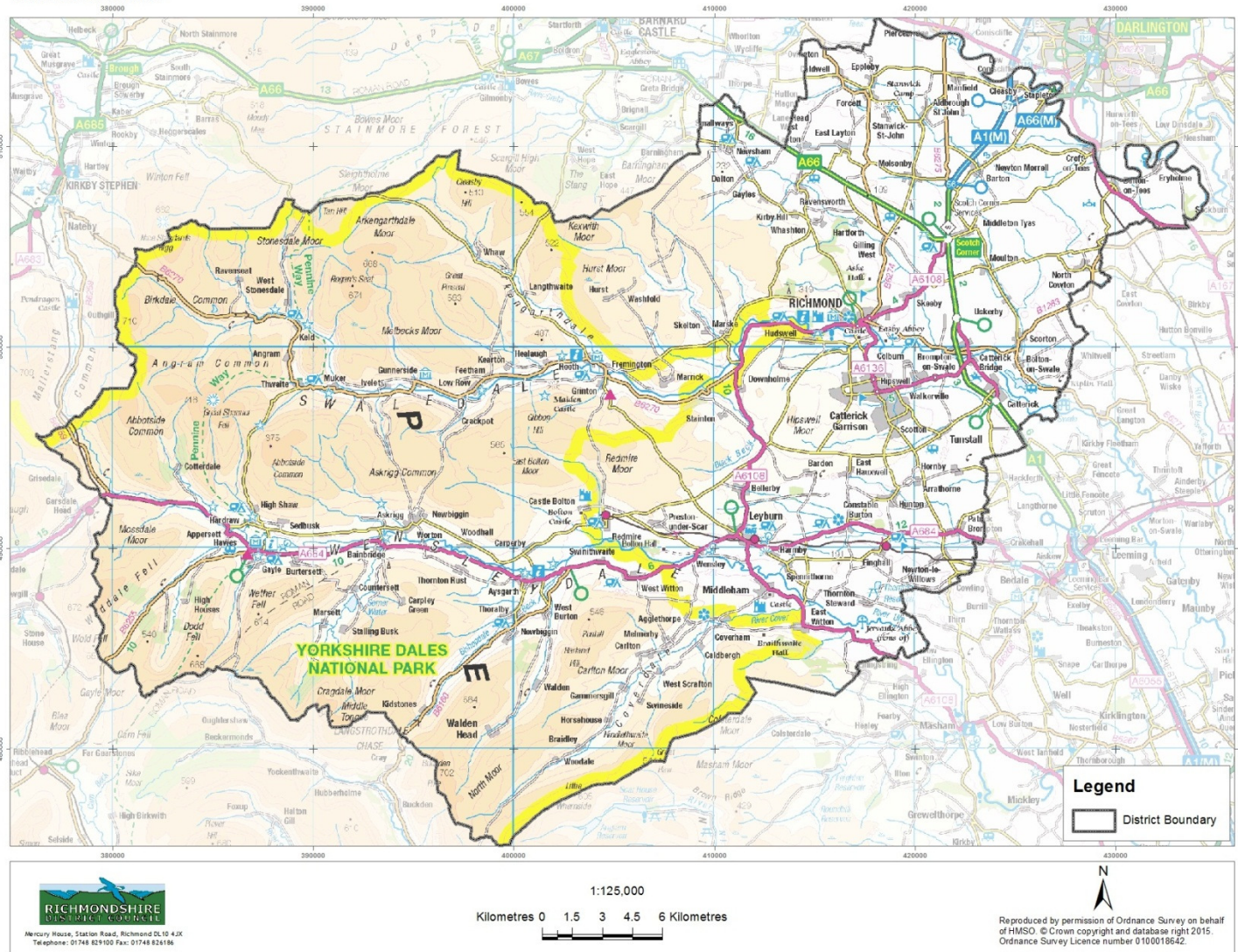


Figure 1 The District of Richmondshire

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 exceedances are considered likely, the local authority must then declare an Air Quality Management Area (AQMA) and prepare an Air Quality Action Plan (AQAP) setting out the measures it intends to put in place in pursuit of the objectives.

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

1.3 Air Quality Objectives

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

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

Pollutant	Air Quality Objective		Date to be achieved by
	Concentration	Measured as	
Benzene	16.25 $\mu\text{g}/\text{m}^3$	Running annual mean	31.12.2003
	5.00 $\mu\text{g}/\text{m}^3$	Running annual mean	31.12.2010

1,3-Butadiene	2.25 µg/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 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
Particles (PM₁₀) (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 LAQM Technical Guidance¹⁸.

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 USA⁹ 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 2012 Updating and Screening Assessment¹² included details of a biomass combustion process which had been reported on in the previous 2009 USA⁹. 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 2012 USA¹² 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 Report¹³ 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.

The 2014 Progress Report¹⁴ 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 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.

Progress Report	May 2014
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	On the basis of the evidence provided the conclusions of the report are accepted by Defra. Defra recommended that, with regard to the monitoring site R7 (Scotch Corner Hotel), the Council consider whether there is a need to reclassify the site as it does not represent a typical 'roadside' site due to it being 22m from the kerbside. It has subsequently been agreed that this classification is the most appropriate but that it should be highlighted in future reports.

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 did manage (under a service level agreement) an automatic monitoring station in Northallerton which lies in Hambleton District until April 2015.

2.1.2 Non-Automatic Monitoring Sites

In Richmondshire there are two separate areas in which diffusion tube monitoring is undertaken for nitrogen dioxide; In Richmond town and at properties located adjacent to the A66 Trunk Road. They are examined separately below. An overview of the location of these tubes is shown on the map at Figure 2.1.

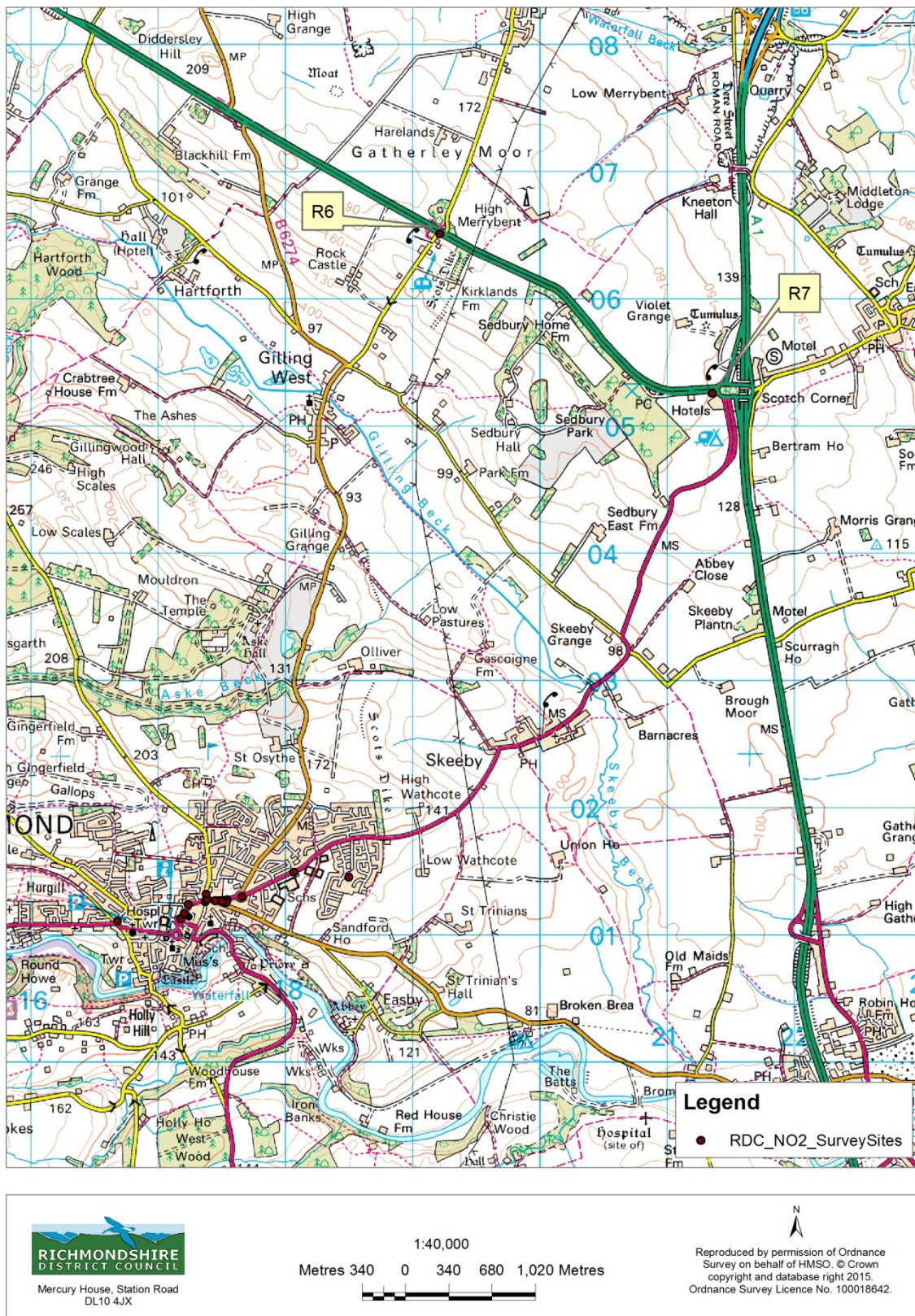


Figure 2.1 Overview Map of Non-Automatic Monitoring Sites in Richmond and along the A66 Trunk Road

Richmond

Nitrogen dioxide (NO₂) has been measured using diffusion tubes at several locations in Richmond. Four of these tubes (R1, R2, R3 and R4) were originally part of the now disbanded National Diffusion Tube Network. These tubes continue to provide information regarding NO₂ levels and assist with the process of local air quality management.

At the start of 2014 a further ten tubes (R8-R18) were installed as part of a short term diffusion tube project. The tubes were located on or near properties which are situated on roads leading to/from Richmond town centre. These areas were identified as having narrow and congested streets.

The location of these tubes is shown on the map at Figure 2.2.

Table 2.1 below summarises the location and exposure for the tubes in Richmond.

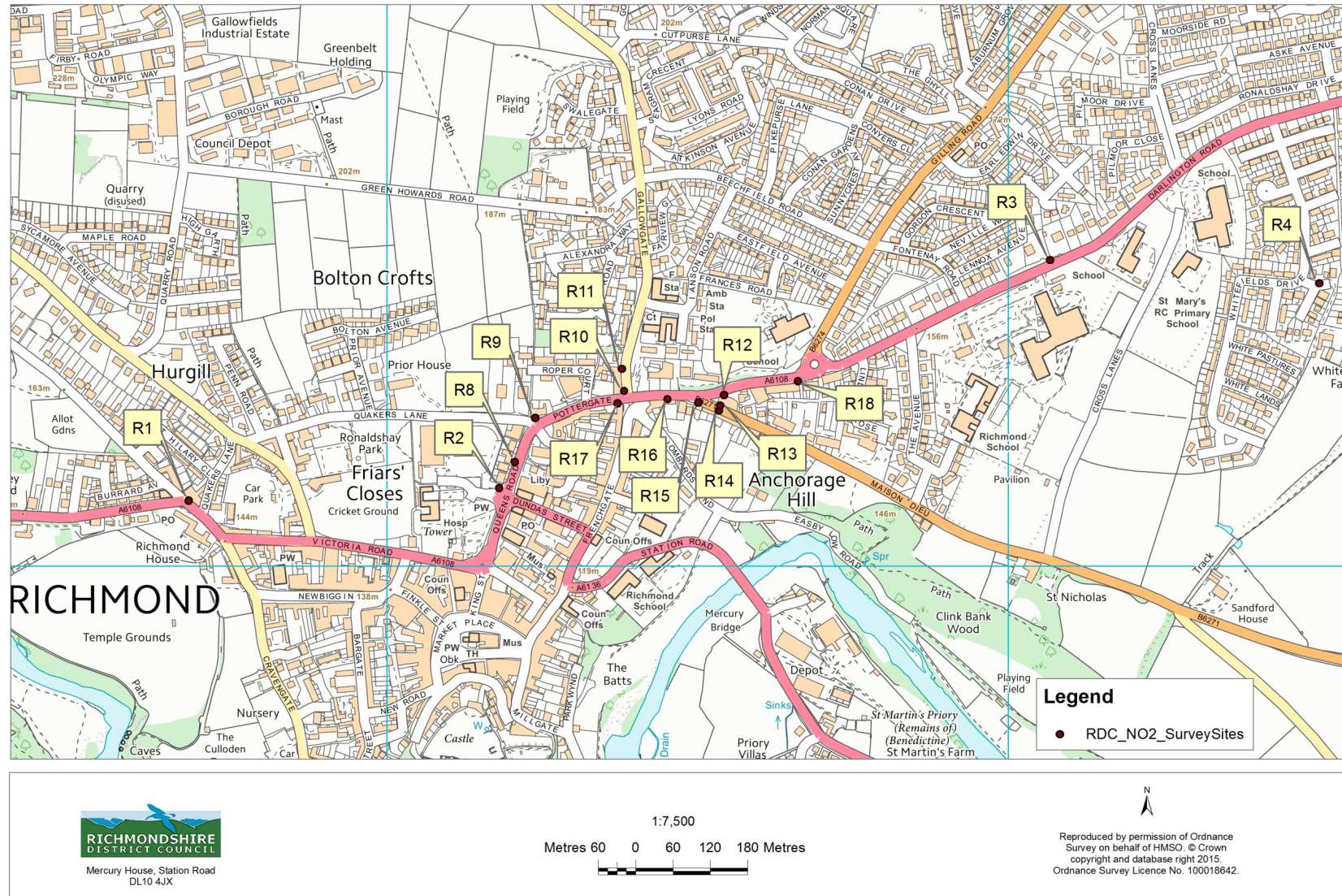


Figure 2.2 Detail Map of Non-Automatic Monitoring Sites in Richmond

Table 2.1 Details of Non-Automatic Monitoring Sites in Richmond

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	3m	NO ₂	N	N	Y (0.5m)	2m	Y
R2	Queens Road	Roadside	417180	501125	3m	NO ₂	N	N	Y (8m)	2m	Y
R3	Darlington Road	Roadside	418066	501490	3m	NO ₂	N	N	Y (22m)	1m	Y
R4	White Rose Crescent	Urban Background	418504	501455	3m	NO ₂	N	N	Y (11m)	2m	Y
R8	15 Queens Road	Roadside	417179	501127	3m	NO ₂	N	N	Y(7m)	2.5m	Y
R9	25 Queens Road	Roadside	417238	501238	4m	NO ₂	N	N	Y(5m)	2m	Y
R10	Oglethorpe	Roadside	417381	501281	3m	NO ₂	N	N	Y(1.7m)	1.7m	Y
R11	7 Gallowgate	Roadside	417377	501317	3m	NO ₂	N	N	Y(0m)	3.3m	Y

Richmondshire District Council

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?
R12	1 Anchorage Hill	Roadside	417542	501275	3m	NO ₂	N	N	Y(3.5m)	1.8m	Y
R13	3 Maison Dieu	Roadside	417536	501258	3m	NO ₂	N	N	Y(0m)	1.4m	Y
R14	10 Maison Dieu	Roadside	417533	501250	3m	NO ₂	N	N	Y(0m)	1.3m	Y
R15	2 Maison Dieu	Roadside	417500	501263	3m	NO ₂	N	N	Y(0m)	1.7m	Y
R16	74 Frenchgate	Roadside	417451	501269	3m	NO ₂	N	N	Y(0m)	1.5m	Y
R17	95 Frenchgate	Roadside	417661	501297	3m	NO ₂	N	N	Y(2m)	1.5m	Y
R18	26 Darlington Road	Roadside	417661	501297	3m	NO ₂	N	N	Y(3.5m)	1.7m	Y

A66 Trunk Road

The purpose of the nitrogen dioxide diffusion tube monitoring along the A66 Trunk Road is to assess for any exceedances of the NO₂ Air Quality Objective following the carriageway improvements undertaken in 2006 and 2007.

Two of the locations (R6 and R7) continued to be monitored in 2014. A map of these locations is shown in Figure 2.3. Details of these locations are shown in Table 2.2. R6 at Gatherley Moor Farm is fixed at the facade of the building and is therefore a relevant exposure. R7 at Scotch Corner Hotel is fixed at the facade of the building however the building is situated 22m from the A66 road and as such is too far away from the kerb to be classed officially as a 'roadside' location.

NB Data was not collected for the site R5 at Grove House (also on the A66) beyond the end of 2013. Data and details of that site can be found in previous years Progress Reports/Updating and Screening Assessments.

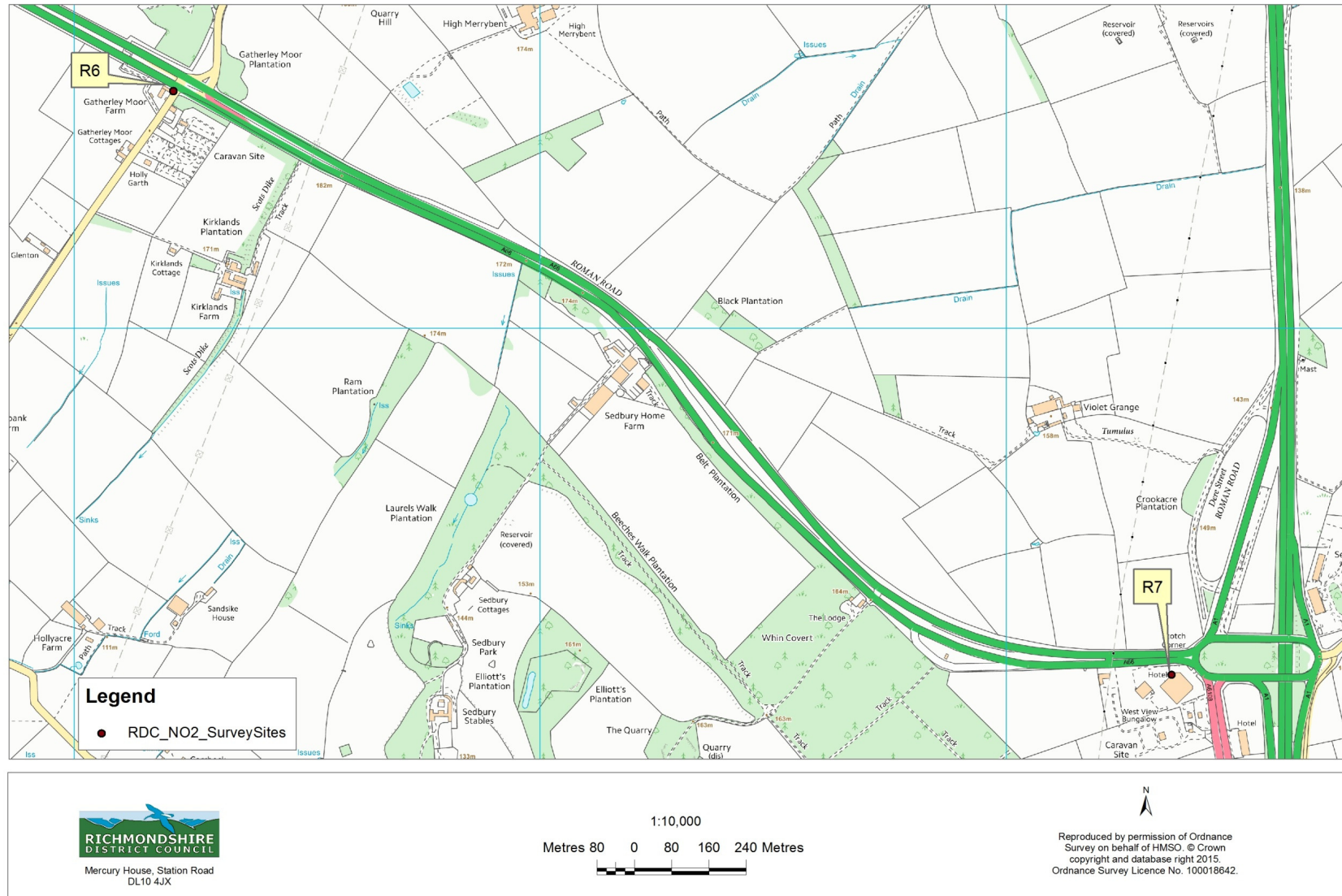


Figure 2.3 Detail Map of Non-Automatic Monitoring Sites along the A66 Trunk Road

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?
R6	Gatherley Moor Farm	Roadside	419207	506509	2m	NO ₂	N	N	Y (0m)	8m	Y
R7	Scotch Corner Hotel	Roadside ¹	421366	505261	3m	NO ₂	N	N	Y (0m)	22m	Y

¹ NB This site is too far away from the kerb to be classed officially as a 'roadside' location according to Local Air Quality Management Technical Guidance LAQM.TG(09)

2.2 Comparison of Monitoring Results with Air Quality Objectives

2.2.1 Nitrogen Dioxide

Diffusion Tube Monitoring Data

The monitoring data for the seventeen nitrogen dioxide diffusion tubes for Richmondshire in 2014 is shown in Table 2.5.

The full set of data for the tubes for 2014 is included in Appendix B.

The monitoring data for six of the nitrogen dioxide diffusion tubes for Richmondshire for the period 2008 to 2014 is shown in Table 2.6, and illustrated in a graph in Figure 2.4.

Table 2.5 Results of Nitrogen Dioxide Diffusion Tubes in Richmondshire in 2014

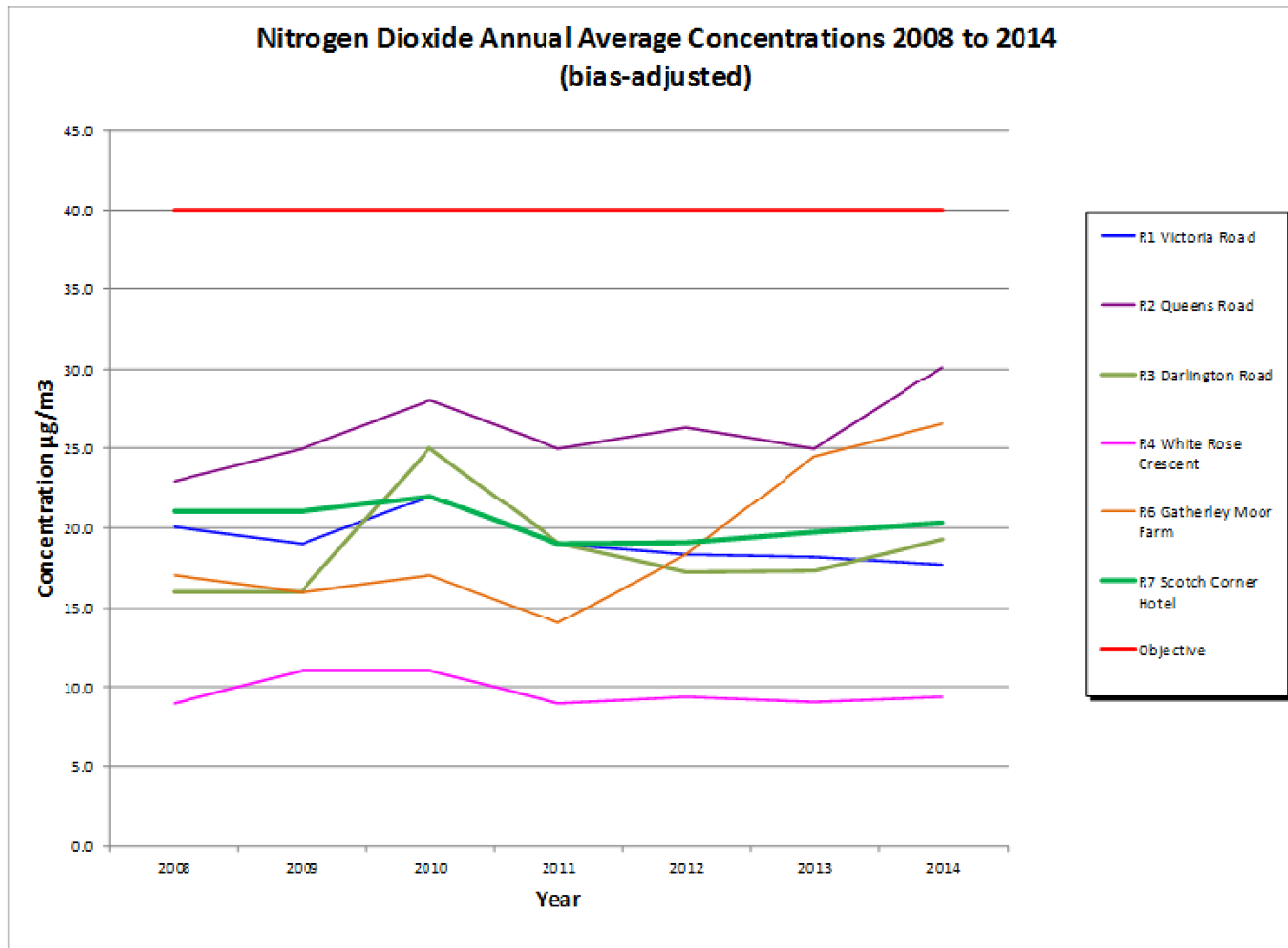
Site ID	Location	Site Type	Within AQMA? (Y/N)	Triplicate or Co-located Tube (Y/N)	Data Capture 2014 (Number of Months)	Data with less than 9 months has been annualised (Y/N)	Confirm if data has been distance corrected (Y/N)	Annual mean concentration (Bias Adjustment factor = 0.83)
								2014 ($\mu\text{g}/\text{m}^3$)
R1	Victoria Road	Roadside	N	N	10	N	N	17.7
R2	Queens Road	Roadside	N	N	12	N	N	30.1
R3	Darlington Road	Roadside	N	N	12	N	N	19.3
R4	White Rose Crescent	Urban Background	N	N	12	N	N	9.4
R6	Gatherley Moor Farm	Roadside	N	N	12	N	N	26.5
R7	Scotch Corner Hotel	Roadside	N	N	11	N	N	20.3
R8	15 Queens Road	Roadside	N	N	12	N	N	33.4
R9	25 Queens Road	Roadside	N	N	12	N	N	25.5
R10	Oglethorpe	Roadside	N	N	12	N	N	37.2
R11	7 Gallowgate	Roadside	N	N	12	N	N	38.1
R12	1 Anchorage Hill	Roadside	N	N	12	N	N	27.1
R13	3 Maison Dieu	Roadside	N	N	12	N	N	28.2
R14	10 Maison Dieu	Roadside	N	N	12	N	N	27.7
R15	2 Maison Dieu	Roadside	N	N	12	N	N	28.7
R16	74 Frenchgate	Roadside	N	N	12	N	N	40.2
R17	95 Frenchgate	Roadside	N	N	12	N	N	32.8
R18	26 Darlington Road	Roadside	N	N	9	N	N	27.5

Table 2.6 Results of Nitrogen Dioxide Diffusion Tubes (2008 to 2014)

Site ID	Site Type	Within AQMA?	Annual Mean Concentration ($\mu\text{g}/\text{m}^3$) - Adjusted for Bias						
			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)	2014 (Bias Adjustment Factor = 0.83)
R1	Roadside	N	20	19.0	21.7	19	18.3	18.2	17.7
R2	Roadside	N	23	24.6	28.3	25	26.3	25.0	30.1
R3	Roadside	N	16	16.4	24.7	19	17.2	17.3	19.3
R4	Urban Background	N	9	10.9	10.7	9	9.4	9.1	9.4
R6	Roadside	N	17	15.7 [†]	16.6	14	18.3	24.5	26.5
R7	Roadside	N	21	21.4 [†]	21.8	19	19.1	19.7	20.3

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

Figure 2.4 Trends in Annual Average NO₂ Concentrations in Richmondshire 2008 to 2014 (bias-adjusted)



Comment on trend results for tube locations monitored from 2008 to 2014

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 which is reported as being as a result of unusually cold weather that year.

Taking 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 the roadside levels for sites R1 and R3 lay between 16 and 24.7 $\mu\text{g}/\text{m}^3$ and for site R2 levels lay between 23 and 30.1 $\mu\text{g}/\text{m}^3$.
- The nitrogen dioxide concentrations at the urban background site in Richmond (R4) have remained consistently low, at around 10 $\mu\text{g}/\text{m}^3$.
- 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 three years. There have been no physical changes to the layout of this junction which could explain this increase. Changes to traffic volumes may have contributed to this change.
- The 'roadside'[#] site at the Scotch Corner Hotel (R7) is near to the A66/A1 roundabout. The nitrogen dioxide concentrations have remained fairly steady over the time period 2008 to 2014. During that period the levels lay between 19 and 21.8 $\mu\text{g}/\text{m}^3$. The levels detected were similar to those detected at two of the roadside sites in Richmond (R1 and R3).

NB This site is too far away from the kerb to be classed officially as a 'roadside' location according to Local Air Quality Management Technical Guidance¹⁸.

Comment on new monitoring results in Richmond R8 – R18 for 2014

Eleven new sites for diffusion tube monitoring were identified as part of the start of monitoring in relation to 'narrow congested streets with residential properties close to the kerb' as identified in the 2014 Progress Report¹⁴ (refer to section 3.1 below). The bias adjusted results are provided in Table 2.5 above. The location plan for these sites is given in Figure 2.2.

The results at 10 of these locations lie between 25.5 and 38.1 $\mu\text{g}/\text{m}^3$, with 1 location (R16) having a result of **40.2 $\mu\text{g}/\text{m}^3$** which is fractionally over the annual mean objective of 40 $\mu\text{g}/\text{m}^3$ for nitrogen dioxide.

Summary – all sites

- **All but one of the concentrations for nitrogen dioxide are below the Annual Mean Air Quality Objective of 40 $\mu\text{g}/\text{m}^3$.**
- **The remaining location has a concentration of 40.2 $\mu\text{g}/\text{m}^3$, which lies just above the Annual Mean Air Quality Objective of 40 $\mu\text{g}/\text{m}^3$. #1**
- **The 1-hour mean Air Quality Objective for nitrogen dioxide is unlikely to be exceeded. #2**

#1- It is considered that it would be wrong to place too much significance on this one result (which is conservative based on an assessment of the bias adjustment factor used – see Appendix A), at this location, at this stage of the monitoring. As such, moving to detailed modelling at this location, is not deemed to be an appropriate or proportionate response at this stage. It is proposed that Richmondshire District Council continue to monitor using diffusion tubes at a number of the locations in this area in order to help assess whether or not there is a likelihood that the objective will not be met in the future.

#2 - Research referred to in the Local Air Quality Management Technical Guidance¹⁸ has shown that where the Annual Mean nitrogen dioxide concentration is less than 60 $\mu\text{g}/\text{m}^3$ 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 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. All but one of Concentrations fall 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

A new area of 'narrow congested streets with residential properties close to the kerb' was identified in the RDC Progress Report 2014. A total of 11 new diffusion tubes were located within the area identified and monitoring commenced in January 2014. These tubes were given references R8-R18 and are located as per Figure 2.2 above. The area identified is outside an AQMA. No AQMA's have previously been declared in RDC.

The characteristics of the area identified are detailed below:

The streets form part of the main traffic approaches to the north east of the town centre in Richmond. Traffic converges in this area with roads coming from:

- North Richmond (including Gallowfields Trading Estate), Ravensworth and the A66
- B6274 Gilling West and the A66
- A6108 Skeeby and the Scotch Corner roundabout (A66/A1 junction)
- B6271 Brompton-on-Swale and the A1
- Richmond Town Centre

Daily traffic flow was estimated to be over 5000 vehicles/day.

The area is frequently congested with slow moving traffic with average speed likely to be less than 15 mph. The traffic lights at the road junction at the War Memorial on Pottergate are designed to enable traffic flow in this area.

One of the streets, namely Maison Dieu, was identified as being 'narrow' having, residential buildings on both sides of the road and being within 2m of the kerb (on both sides).

Richmondshire District Council has identified congested streets with a flow above 5,000 vehicles per day and residential properties close to the kerb, new or not adequately considered in previous rounds of Review and Assessment. In light of initial results RDC will continue monitoring in order to help assess whether or not there is a likelihood that the objective will not be met in the future.

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/HGVs.

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

A new road development was identified in the RDC Progress Report 2013. The road development involves the upgrade of the A1 from a dual carriageway to a 3-lane motorway A1(M) between Leeming Bar, which is south of the District, and Barton, which is in the north of the District. The upgrading includes the development of two

local access roads (LAR), one of which is in Richmondshire and runs between Scotch Corner and Barton and which runs roughly parallel to the motorway. This development commenced in 2013 and is due to be completed in Spring 2017.

A Highways Agency report 'A1 Dishforth to Barton Improvement, Leeming to Barton Section, Environmental Assessment Report, Volume 1'¹⁵ has been considered.

The methodology and outcome of the report has been summarised below:

The report contains a section entitled 'Air Quality' in which the potential impact on air quality in terms of nitrogen dioxide and particulate matter has been considered during both the construction and operational phases in relation to the proposed LAR.

Construction Phase

The authors of the report used methodology with reference to that published by the Institute of Air Quality Management (IAQM). The report identified two receptors and reported the distances from them to the proposed construction routes and LAR. It also assessed the risk of the dust effects on those receptors with regard to; earthworks; construction and track-out (no demolition activities identified) with the risk effects reported as medium, low and medium respectively for these activities. The significance of PM₁₀ and dust soiling effects was determined for each construction phase activity (without mitigation measures being adopted). The sensitivity of the area was classed as 'low' therefore overall the significance of the activities undertaken (without mitigation measures) during construction would be considered 'negligible'.

Operational Phase

The report used methodology in the Design Manual for Roads and Bridges (DMRB) Volume 11, Section 3, Part 1 HA 207/07. It identified the new LAR (Scotch Corner to Barton) as an 'affected road' and as having two receptors (residential properties) being located within 200m of the LAR. The report discussed changes to traffic flows and model verification in relation to known monitoring results (that of passive diffusion tube monitoring conducted in 2010 by AECOM and with reference to the historic Richmondshire diffusion tube results for R7 at Scotch Corner Hotel). It

indicated that, in relation to predicted road traffic figures (2017 compared to 2012), the development (ie the upgrade of the A1 with a LAR) will not result in a net increase in vehicles (but a shift for some of the vehicles from the A1 to the LAR). The effect on the receptors was described based on the predicted absolute changes in the NO₂ and PM₁₀ concentrations and with the magnitude of effect on the identified receptors classified as 'imperceptible' with the significance of the effects regarded as 'negligible'.

In summary the report does not predict any exceedances of the air quality objectives for annual mean NO₂ concentrations or annual mean PM₁₀ concentrations for the identified receptors in this area.

RDC considers that the above report is sufficient for review and assessment purposes.

Richmondshire District Council has assessed new/proposed roads meeting the criteria in Section A.5 of Box 5.3 in LAQM.TG(09), and concluded that it is not necessary to proceed to a Detailed Assessment.

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 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

Several new biomass boiler installations were identified in the 2014 Progress Report¹⁴. Additional installations identified through planning applications in 2014 are detailed below:

New biomass boilers – planning permissions

Two premises (commercial) were granted planning permission by the RDC planning authority in 2014 for biomass boilers (90kW and 199kW) in Catterick Garrison and Leyburn.

Two premises (domestic) were granted planning permission by the RDC planning authority in 2014 to build smaller scale (< 90kW) biomass boilers. The locations are: Stapleton and Aldbrough St John.

No permissions were granted by the Yorkshire Dales National Park for biomass boilers in 2014.

The largest of the biomass boilers (two boilers at the same location at 0.6 MW and 1 MW) identified in the 2014 Progress Report¹⁴ (at a military barracks) were considered as part of a desktop exercise (with calculations in Appendix B of that report) and the findings reported. The assessment concluded that '*...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) reported in 2013 and 2014 it is considered that, based on the findings, no further individual assessments would be required on the additional biomass boilers identified for 2014.

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

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

6.3 Domestic Solid-Fuel Burning

The 2003 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. A Detailed Assessment⁴ undertaken in 2004/2005 for the village of Middleham concluded that no further action was required for sulphur dioxide.

There have been no significant changes with respect to this source subsequent to those assessments in Richmondshire, as such the assessment remains valid.

Richmondshire District Council has previously assessed areas of significant domestic solid fuel use, and concluded that it will not be necessary to proceed to a further Detailed Assessment.

7 Fugitive or Uncontrolled Sources

A new road development was identified in the 2013 Progress Report¹³. Please refer to Section 3.5 above where PM₁₀ was considered as part of the Environmental Assessment Report¹⁵. Two receptors were identified as having relevant exposure (within 200m of the source) in that report. In summary the report does not predict any exceedances of the air quality objectives for annual mean PM₁₀ concentrations for the identified receptors. In addition these sites do not meet the criteria (as set out in Section E, Box 5.10 of the LAQM Technical Guidance¹⁸ that would require RDC to proceed to a detailed assessment.

Richmondshire District Council confirms that there are no potential sources of fugitive particulate matter emissions that meet the specified criteria in Section E, Box 5.10 of LAQM.TG(09) 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. There has been one exceedance of the current annual mean objective for nitrogen dioxide for one of the newly monitored locations in Richmond. The figure reported ($40.2\mu\text{g}/\text{m}^3$) is considered to be conservative and lies just above the Annual Mean Air Quality Objective of $40\mu\text{g}/\text{m}^3$.

8.2 Conclusions from Assessment of Sources

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

8.3 Proposed Actions

The 2015 Updating and Screening Assessment has not identified the need to proceed to a Detailed Assessment in an area in Richmond. It is proposed that monitoring using diffusion tubes continues at a number of locations in the area of the exceedance to help assess whether or not there is a likelihood that the annual mean objective for nitrogen dioxide will be met in the future.

As no AQMA's exist in Richmondshire, the next course of action will be to continue monitoring and produce the 2016 Progress Report.

9 References

- 1 Richmondshire District Council (1999) Stage 1 Air Quality Review and Assessment.
- 2 Laxen D (December 1999) Air Quality Monitoring in Richmondshire
- 3 Wilson P & Marnier Dr B, Air Quality Consultants Ltd in association with Richmondshire District Council (2003)
Updating and Screening Assessment of Air Quality in the District of Richmondshire 2003
- 4 Laxen Prof. D & Wilson P, Air Quality Consultants Ltd on behalf of Richmondshire District Council (2005)
Detailed Assessment of Sulphur Dioxide Emissions from Domestic Solid Fuel Sources 2005
- 5 Richmondshire District Council (2005)
Air Quality in the District of Richmondshire Progress Report 2005
- 6 Richmondshire District Council (2006)
Updating and Screening Assessment of Air Quality in the District of Richmondshire 2006.
- 7 Richmondshire District Council (2007)
Air Quality in the District of Richmondshire – Progress Report 2007
- 8 Richmondshire District Council (2008)
Air Quality in the District of Richmondshire – Progress Report 2008
- 9 Richmondshire District Council (2009)
2009 Air Quality Updating and Screening Assessment for Richmondshire District Council
- 10 Richmondshire District Council (2010)
2010 Air Quality Progress Report for Richmondshire District Council
- 11 Richmondshire District Council (2011)
2011 Air Quality Progress Report for Richmondshire District Council.
- 12 Richmondshire District Council (2012)
2012 Air Quality Updating and Screening Assessment for Richmondshire District Council
- 13 Richmondshire District Council (2013)
2013 Air Quality Progress Report for Richmondshire District Council.
- 14 Richmondshire District Council (2014)
2014 Air Quality Progress Report for Richmondshire District Council.
- 15 Highways Agency / Carillion / Morgan Sindall JV (May 2013)
A1 Dishforth to Barton Improvement, Leeming to Barton Section, Environmental Assessment Report, Volume 1
- 16 AEA Energy and Environment (2008)
Diffusion Tubes for Ambient NO₂ Monitoring: Practical Guidance for Laboratories and Users
- 17 LAQM Helpdesk (September 2012)
Summary of Laboratory Performance for WASP NO₂ Proficiency Testing Rounds 121-124 and AIR NO₂ PT rounds AR001, 3, 4 and 6.

Reports are prepared by HSL for BV/NPL on behalf of Defra and the Devolved Administrations.

- 18 Department of Environment, Food and Rural Affairs (2009)
Local Air Quality Management - Technical Guidance

Appendices

Appendix A: Quality Assurance / Quality Control Data

Appendix B: Full set of raw diffusion tube data for Richmondshire 2014 – non-bias adjusted.

Appendix A: Quality Assurance / Quality Control Data

Diffusion Tube Bias Adjustment Factor from Local Co-location Study

Until April 2015 Richmondshire District Council provided Environmental Services to Hambleton District Council. All of the Richmondshire and Hambleton diffusion tubes for 2014 were collected and submitted together. Three of the diffusion tubes were co-located with an Automatic Monitoring Site situated in Northallerton (in Hambleton District).

The bias adjustment factor for these tubes has been calculated as **0.83** (the bias adjustment calculations will be available in the 2015 Updating and Screening Assessment Report for Hambleton District Council once it is published).

Diffusion Tube Bias Adjustment Factors

The diffusion tubes used in Richmondshire are supplied and analysed by Environmental Scientifics Group (ESG), Didcot, Oxfordshire. The tubes used contain a mesh which is doped with 50% v/v triethanolamine (TEA) and acetone. Details of the tubes are provided in Table A.1

Table A.1 Summary of type of Nitrogen Dioxide Diffusion tubes used in Richmondshire

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

It is known that there are systematic differences in the performance of different laboratories and preparation methods of diffusion tubes. A spreadsheet (Version Number 03/15) provided by the LAQM Helpdesk (which can be viewed at <http://laqm.defra.gov.uk/bias-adjustment-factors/national-bias.html>) shows the

Richmondshire District Council

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 tube type '50% TEA in acetone' (ie the same lab and tube type as used in Richmondshire) there were 22 co-location studies submitted for 2014 (at the time the spreadsheet was accessed). For this group an overall bias adjustment factor of **0.81** was reported. A copy of the relevant section of the table provided by the LAQM Helpdesk is shown in Table A.2 below.

Table A.2 National Diffusion Tube Bias Adjustment Factor Spreadsheet Version 03/15

National Diffusion Tube Bias Adjustment Factor Spreadsheet								Spreadsheet Version Number: 03/15			
Follow the steps below <u>in the correct order</u> to show the results of <u>relevant</u> 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 June 2015 LAQM Helpdesk Website			
The LAQM Helpdesk is operated on behalf of Defra and the Devolved Administrations by Bureau Veritas, in conjunction with contract partners AECOM and the National Physical Laboratory.						Spreadsheet maintained by the National Physical Laboratory. Original compiled by Air Quality Consultants Ltd.					
Step 1:		Step 2:	Step 3:	Step 4:							
Select the Laboratory that Analyzes 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 shown, we have no data for this laboratory.		If a preparation method is not shown, we have no data for this method at this laboratory.	If a year is not shown, we have no data ² .	If you have your own co-location study then see footnote ⁴ . If uncertain what to do then contact the Local Air Quality Management Helpdesk at LAQMHelpdesk@uk.bureauveritas.com or 0800 0327953							
Analysed By ¹	Method	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	2014	R	Cambridge City Council	12	47	37	25.5%	G	0.80	
ESG Didcot	50% TEA in acetone	2014	R	Dumfries and Galloway Council	12	35	30	16.5%	G	0.86	
ESG Didcot	50% TEA in acetone	2014	UB	Falkirk	12	23	20	19.3%	G	0.84	
ESG Didcot	50% TEA in acetone	2014	B	Gravesham Borough Council	12	27	25	11.6%	P	0.90	
ESG Didcot	50% TEA in acetone	2014	R	Gravesham Borough Council	12	40	31	29.6%	G	0.77	
ESG Didcot	50% TEA in acetone	2014	UB	Kingston upon Hull City Council	12	32	26	22.6%	G	0.82	
ESG Didcot	50% TEA in acetone	2014	KS	Marglebone Road Intercomparison	10	109	80	35.2%	P	0.74	
ESG Didcot	50% TEA in acetone	2014	R	North East Lincolnshire Council	11	59	49	19.5%	G	0.84	
ESG Didcot	50% TEA in acetone	2014	R	North East Lincolnshire Council	11	34	30	12.3%	G	0.89	
ESG Didcot	50% TEA in acetone	2014	B	Pembrokeshire Council	11	7	3	110.8%	P	0.47	
ESG Didcot	50% TEA in acetone	2014	KS	South Northamptonshire Council	11	43	31	36.5%	G	0.73	
ESG Didcot	50% TEA in acetone	2014	UI	Stockton on Tees	11	25	22	17.7%	P	0.95	
ESG Didcot	50% TEA in acetone	2014	R	Stockton on Tees	12	21	16	35.2%	G	0.74	
ESG Didcot	50% TEA in acetone	2014	R	Swale Borough Council	9	42	33	28.4%	P	0.78	
ESG Didcot	50% TEA in acetone	2014	R	Swale Borough Council	12	50	38	31.7%	P	0.76	
ESG Didcot	50% TEA in acetone	2014	SU	Thanet District Council	12	19	17	9.0%	P	0.92	
ESG Didcot	50% TEA in acetone	2014	R	Thanet District Council	12	28	27	6.0%	P	0.94	
ESG Didcot	50% TEA in acetone	2014	R	Wrexham County Borough Council	10	23	22	5.6%	G	0.95	
ESG Didcot	50% TEA in acetone	2014	UB	City of York Council	11	24	19	28.4%	P	0.78	
ESG Didcot	50% TEA in acetone	2014	R	City of York Council	10	37	27	36.7%	G	0.73	
ESG Didcot	50% TEA in acetone	2014	R	City of York Council	11	32	28	12.4%	G	0.89	
ESG Didcot	50% TEA in acetone	2014	R	City of York Council	11	40	36	12.7%	G	0.89	
ESG Didcot	50% TEA in acetone	2014		Overall Factor² (22 studies)				Use		0.81	

Discussion of Choice of Factor to Use

The bias adjustment figure applied to the co-located Hambleton tubes of 0.83 has been deemed appropriate to use in Richmondshire based on the fact that:

- Hambleton is located adjacent to the east and southeast of Richmondshire and is a similarly rural district.
- The Richmondshire and Hambleton diffusion tubes for 2014 were collected and submitted to the laboratory together.
- The figure of 0.83 is similar to the national bias adjustment factor of 0.81 (as detailed above).
- All but one of the results using the 0.83 figure fall under the annual mean objective for nitrogen dioxide ($40 \mu\text{g}/\text{m}^3$).
- The single result which does exceed the objective does so when the 0.83 bias adjustment factor is applied to the results for the site R16 (with a result of **$40.2 \mu\text{g}/\text{m}^3$**). If the 0.81 bias adjustment factor were to be applied to the same results for the site R16 it would give a result of $39.2 \mu\text{g}/\text{m}^3$ and as such would lie below the mean objective. Richmondshire District Council is satisfied that the use of the figure 0.83 is therefore conservative.
- The use of the factor does not significantly affect the end results.

This figure of **0.83** has therefore been applied (multiplied) to the 2014 diffusion tube results for Richmondshire.

QA/QC of Diffusion Tube Monitoring

The diffusion tubes used in Richmondshire 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 used contain a mesh which is doped with 50% v/v triethanolamine (TEA) and acetone. They are exposed according to the monthly

schedule supplied available on the LAQM Helpdesk
(<http://laqm.defra.gov.uk/diffusion-tubes/data-entry.html>).

Tube precision

The LAQM Helpdesk indicates that '*Diffusion tube precision can be described as the ability of a measurement to be consistently reproduced, i.e. how similar the results of duplicate or triplicate tubes are to each other.*' A spreadsheet of diffusion tube co-location results, published by the Helpdesk, '*contains information on the precision of diffusion tubes*'. The tubes are classified as having either 'good' or 'poor' precision. The helpdesk states '*The distinction between "good" and "poor" precision is an indicator of how well the same measurement can be reproduced. This precision will reflect the laboratory's performance/consistency in preparing and analysing the tubes, as well as the subsequent handling of the tubes in the field. Any laboratory can show "poor" precision for a particular period/co-location study, if this is due to poor handling of the tubes in the field.*'

The tube precision results for the same laboratory and tube type as used by Richmondshire are shown in a column of the spreadsheet (Version Number 03/15) provided by the LAQM Helpdesk and replicated in Table A.2 above. Just over half of the results are shown as 'good'.

A summary of the current QA/QC arrangements applied to the diffusion tubes is provided in Table A.3.

Table A.3 Summary of Nitrogen Dioxide Diffusion Tube Monitoring QA/QC relating to Richmondshire

Supplier and analyst	Environmental Scientifics Group (ESG)
Tube precision	Majority classed as 'Good'
Participant of the Workplace Analysis Scheme for Proficiency (WASP):	Yes ESG participates
Current WASP Rating:	'Satisfactory'
Method accreditation:	UKAS
Conforms to harmonisation Practical Guidance*:	Yes

* Harmonisation Practical Guidance 'Diffusion Tubes for Ambient NO₂ Monitoring: Practical Guidance for Laboratories and Users'¹⁶.

Workplace Analysis Scheme for Proficiency (WASP)

Environmental Scientifics Group (ESG), Didcot, Oxfordshire is a participant of WASP. WASP is an independent analytical proficiency-testing scheme operated by the Health and Safety Laboratory (HSL). The laboratory is rated the top rating of 'Satisfactory' under the WASP performance criteria set by the HSL for the most recent rounds of testing (Rounds 121-124 and AIR-PT Rounds 1,3,4 and 6 (Apr 2013 – Feb 2015¹⁷). A copy of the summary table is replicated in Table A.4 with further information available at <http://laqm.defra.gov.uk/diffusion-tubes/qa-qc-framework.html>)

Table A.4 Laboratory summary performance for WASP NO₂ Rounds 121-124 and AIR NO₂ PT Rounds AR001, 3, 4 and 6Table 1: Laboratory summary performance for WASP NO₂ PT Rounds 121-124 and AIR NO₂ PT rounds AR001, 3, 4 and 6

The following table lists those UK laboratories undertaking LAQM activities that have participated in recent WASP/AIR NO₂ PT rounds and the percentage (%) of results submitted which were subsequently determined to be **satisfactory** based upon a z-score of $\leq \pm 2$ as defined above.

WASP Round	WASP R121	WASP R122	WASP R123	WASP R124	AIR PT AR001	AIR PT AR003	AIR PT AR004	AIR PT AR006
Round conducted in the period	April – June 2013	July – September 2013	October – December 2013	January – March 2014	April – May 2014	July – August 2014	October – November 2014	January – February 2015
Aberdeen Scientific Services	100 %	100 %	NR [2]	75 %	100 %	100 %	100 %	100 %
Cardiff Scientific Services	100 %	100 %	100 %	100 %	NR [3]	NR [3]	NR [3]	NR [3]
Edinburgh Scientific Services	100 %	75 %	100 %	100 %	100 %	100 %	100 %	75 %
Environmental Services Group, Didcot [1]	100 %	100 %	100 %	100 %	100 %	100 %	100 %	87.5 %
Exova (formerly Clyde Analytical)	NR [2]	NR [2]	NR [2]	50 %	NR [3]	NR [3]	NR [3]	NR [3]
Glasgow Scientific Services	25 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %
Gradko International [1]	100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %
Kent Scientific Services	75 %	100 %	100 %	100 %	NR [3]	NR [3]	NR [3]	NR [3]
Kirklees MBC	100 %	100 %	100 %	100 %	100 %	100 %	100 %	75 %
Lambeth Scientific Services	0 %	50 %	75 %	25 %	50 %	100 %	100 %	25 %
Milton Keynes Council	100 %	75 %	75 %	75 %	100 %	100 %	75 %	100 %
Northampton Borough Council	100 %	100 %	100 %	100 %	100 %	0 %	0 %	100 %
Somerset Scientific Services	100 %	75 %	100 %	100 %	100 %	100 %	100 %	100 %
South Yorkshire Air Quality Samplers	100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %
Staffordshire County Council	100 %	100 %	100 %	100 %	100 %	25 %	100 %	100 %
Tayside Scientific Services (formerly Dundee CC)	100 %	100 %	100 %	100 %	NR [2]	100 %	100 %	100 %
West Yorkshire Analytical Services	100 %	50 %	100 %	75 %	75 %	100 %	75 %	100 %

[1] Participant subscribed to two sets of test samples (2 x 4 test samples) in each WASP/AIR PT round.

[2] NR No results reported

[3] Kent Scientific Services, Cardiff Scientific Services and Exova (formerly Clyde Analytical) no longer carry out NO₂ diffusion tube monitoring and therefore did not submit results.

Appendix B: Full set of raw diffusion tube data for Richmondshire 2014 – non-bias adjusted

Table B.1 Non-bias adjusted results for sites R1-R4, R6-R18 in $\mu\text{g}/\text{m}^3$ (with average bias adjusted figures given below).

Date	R1	R2	R3	R4	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15	R16	R17	R18
Jan-14	27.1	45.4	35.0	17.1	39.1	34.3	39.0	43.2	51.7	53.9	47.5	41.0	43.1	26.2	65.9	48.3	~
Feb-14	16.0	32.5	23.4	13.1	27.5	18.9	44.6	34.6	45.6	53.3	40.5	38.8	39.4	41.0	53.1	39.0	~
Mar-14	22.3	35.2	26.8	15.4	38.2	27.7	49.9	31.7	47.8	45.5	40.0	40.6	37.3	32.8	49.4	43.0	~
Apr-14	24.2	32.5	23.4	13.8	34.9	#	43.2	31.5	47.5	40.0	30.7	34.1	32.7	33.1	48.3	39.8	31.5
May-14	#	34.7	20.0	7.1	30.3	20.8	34.6	31.3	41.4	41.7	24.7	30.0	28.4	30.6	46.4	37.7	30.5
Jun-14	#	32.3	15.5	5.1	28.9	20.5	31.7	21.6	36.9	39.3	25.2	23.9	21.4	24.8	41.5	36.9	24.9
Jul-14	14.9	35.2	17.8	7.2	28.2	23.6	38.7	28.9	43.3	47.1	27.1	31.7	29.8	32.1	44.2	37.7	32.0
Aug-14	16.1	32.0	17.5	5.7	24.3	21.6	24.6	16.5	37.8	40.3	17.9	19.4	21.1	21.0	23.8	27.9	28.9
Sep-14	23.2	38.9	23.2	11.1	36.6	30.5	42.0	33.1	42.3	50.2	30.7	34.4	35.0	38.2	46.1	43.3	36.0
Oct-14	18.5	37.2	22.8	9.7	24.4	23.6	43.0	30.8	41.8	38.8	34.2	34.5	34.3	38.0	49.4	33.4	37.0
Nov-14	34.7	49.7	32.5	17.7	42.3	27.4	47.5	37.5	50.4	51.1	43.0	48.4	40.8	58.1	65.0	51.9	45.3
Dec-14	16.5	29.0	21.3	12.7	27.4	19.2	43.5	27.9	51.4	48.7	29.6	31.1	36.7	38.7	47.6	34.5	31.4
Annual Average	21.4	36.2	23.3	11.3	31.8	24.4	40.2	30.7	44.8	45.8	32.6	34.0	33.3	34.6	48.4	39.5	33.1
Annual Average figures bias adjusted (factor 0.83)	17.7	30.1	19.3	9.4	26.4	20.2	33.4	25.5	37.2	38.0	27.1	28.2	27.7	28.7	40.2	32.7	27.4

Tube missing

~ Not sampled