2009 Air Quality Updating and Screening Assessment for *Richmondshire District Council*

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

Date (April, 2009)

Richmondshire District Council

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Executive Summary

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

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

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~~1~~ Introduction

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1.1 Description of the of District Richmondshire

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

Figure 1 The District of Richmondshire

1.2 Purpose of Report

This report fulfils the requirements of the Local Air Quality Management process as set out in Part IV of the Environment Act (1995), the Air Quality Strategy for England, Scotland, Wales and Northern Ireland 2007 and the relevant Policy and Technical Guidance documents. The LAQM process places an obligation on all local authorities to regularly review and assess air quality in their areas, and to determine whether or not the air quality objectives are likely to be achieved. Where exceedences are considered likely, the local authority must then declare an Air Quality Management Area (AQMA) and prepare an Air Quality Action Plan (AQAP) setting out the measures it intends to put in place in pursuit of the objectives.

1.3 Air Quality Objectives

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

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

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

1.4 Summary of Previous Review and Assessments

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

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

The third round of Review and Assessment began in 2006 with another Updating and Screening Assessment (USA).[vi] The 2006 USA concluded that there was no likelihood of exceedences of any of the air quality objectives.

The 2007 Progress Report[vii] concluded there was no likelihood of the exceedence of any of the air quality objectives. As a precaution diffusion tubes were placed at strategic locations along the A66 within the District to see if upgrading the road to dual carriageway has caused an exceedence of the nitrogen dioxide objectives. The tubes were in place for 12 months, but no likelihood of exceedence of the annual mean nitrogen dioxide objective was found.

The 2008 Progress Report[viii] concluded there was no likelihood of the exceedence of any of the air quality objectives but recognised that work to upgrade the A1 from 2 to 3 lane carriageway within the District will begin imminently with an estimated completion date during 2010. The potential effect on air quality will be considered in this, the 2009 USA. Reports from the third round Review and Assessment are summarised in Table 1.4.3.

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 20003**
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	**20004/2005**
Sulphur Dioxide	Fuel use survey revealed Middleham to have over 100 properties within a 500m x 500m area that use solid fuel as primary heating source. 3 months monitoring between December 2004 and March 2005 revealed an AQMA was not necessary. As Middleham has the highest concentration of properties with solid fuel as their primary source of heating, no further action was required for other settlements.
Appraisal Summary	Conclusions accepted for sulphur dioxide.

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

Table 1.4.3 Summary of the Third Round of Review and Assessment

USA	**April 20006**
All pollutants	No exceedences of objectives expected. No further action required for all pollutants.
Appraisal Summary	Conclusions accepted for all pollutants.

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

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

2 New Monitoring Data

2.1 Summary of Monitoring Undertaken

2.1.1 Automatic Monitoring Sites

No automatic monitoring is undertaken in Richmondshire.

2.1.2 Non-Automatic Monitoring

Nitrogen Dioxide has been measured using diffusion tubes at four locations in Richmond, formerly as part of the now disbanded National Diffusion Tube Network. They now provide valuable information regarding NO_2 levels and assist with the process of local air quality management. Table 2.1 below summarises the location and exposure for the tubes in Richmond. The location of the tubes is also illustrated in Map 1.

Table 2.1 Details of Non- Automatic Monitoring Sites

Site Name	Site Type	OS Grid Ref	Pollutants Monitored	In AQMA ?	Relevant Exposure? *(Y/N with distance (m) to relevant exposure)*	Distance to kerb of nearest road *(N/A if not applicable)*	Worst-case Location ?
R1	Roadside	X 416688 Y 501097	NO_2	N	Y (0.5m)	2m	Y
R2	Roadside	X 417180 Y 501125	NO_2	N	Y (8m)	2m	Y
R3	Roadside	X 418066 Y 501490	NO_2	N	Y (22m)	1m	Y
R4	Urban Background	X 418504 Y 501455	NO_2	N	Y (250m)	2m	Y

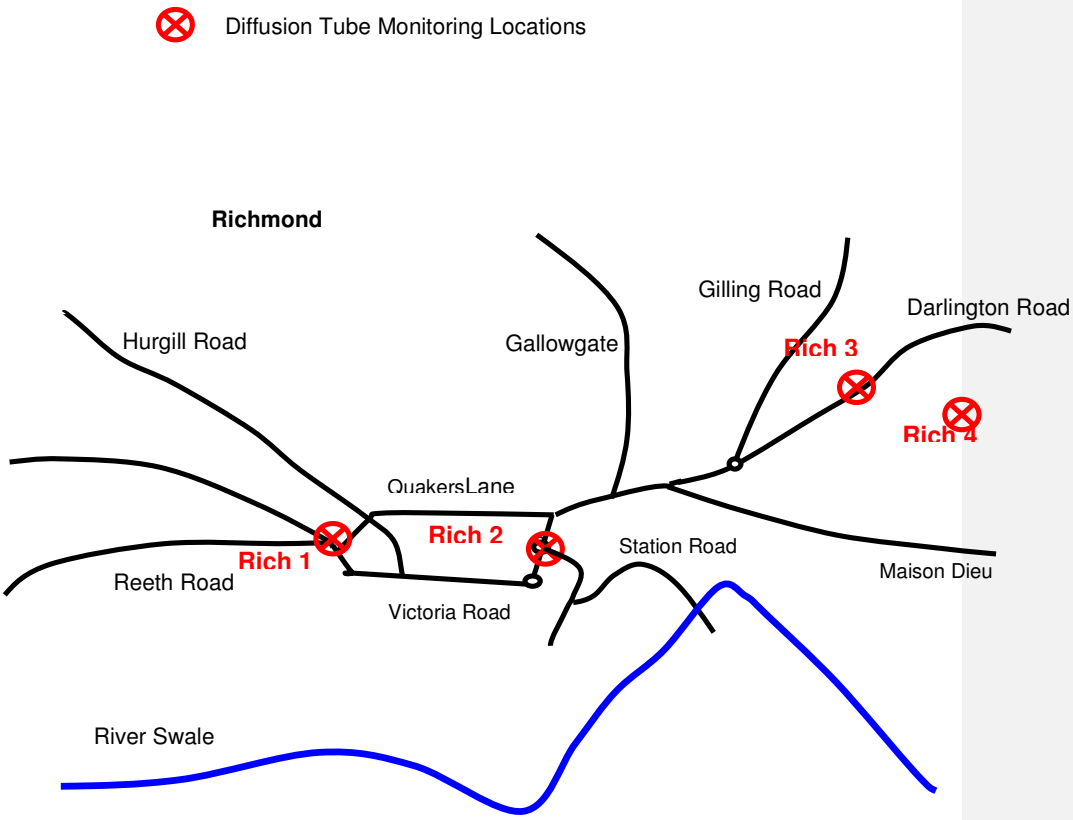
The tubes are positioned on lampposts adjacent to major roads running through Richmond. These locations were chosen for the following reasons:

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

Table 2.1 indicates the distances from the diffusion tube locations to the façade of the nearest residential dwelling. The addresses of these properties are contained in table 2.4a. All have relevant exposure:

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

Nitrogen Dioxide Diffusion Tube Monitoring Locations in Richmondshire



Map 1: Diffusion Tube Locations in Richmond, North Yorkshire

The tubes are supplied by Harwell Scientifics. Jesmond Dene Laboratory In Newcastle upon Tyne, which is part of the WASP laboratory intercomparison scheme, analyses the diffusion tubes. The tubes contain a mesh which is doped with 50% v/v triethanolamine (TEA) in acetone. They are exposed according to the monthly schedule dictated by NETCEN. The above arrangements remain the same as those described in the 2003 and 2006 Updating and Screening Assessments of Air Quality in the District of Richmondshire. A summary of the QA/QC arrangements applied to the diffusion tubes is provided in Table 2.2.

Table 2.2: Nitrogen Dioxide Diffusion Tube Monitoring QA/QC

Supply	AEA Technology, Harwell Scientifics
Analysis	Jesmond Dene Laboratory
Preparation Method	50% v/v TEA in acetone
Type of tube	Palmes tube
Type of absorbent	Doped triethanolamine mesh
Membership of inter-laboratory comparison scheme	WASP
Current Rating	Good
Method accreditation	No accreditation for laboratory
Conforms to Harmonisation Practical Guidance	No

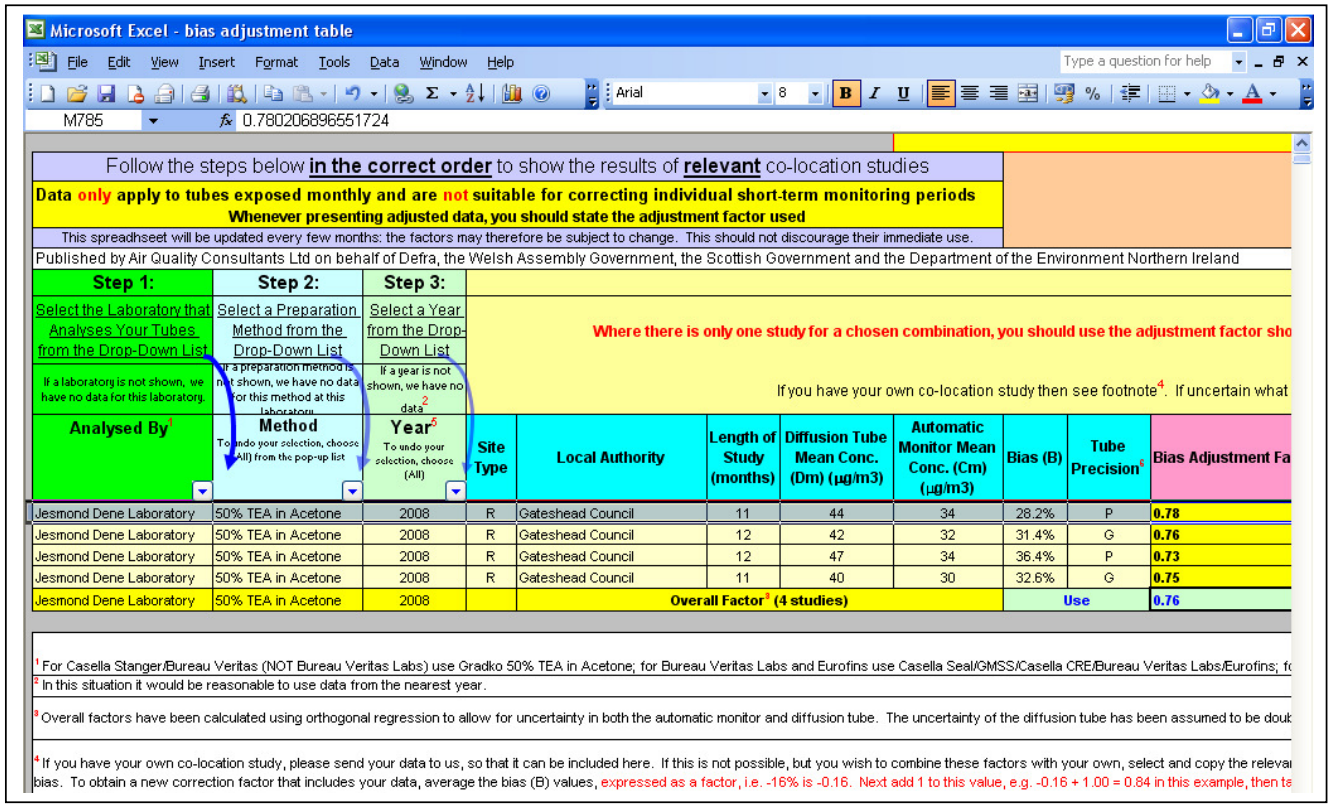
The laboratory does not conform to the recent Harmonisation Practical Guidance "Diffusion Tubes Ambient NO_2 Monitoring: Practical Guidance for Laboratories and Users" AEA Energy and Environment (Feb 2008). Despite this, Richmondshire District Council has decided to continue using the laboratory for a number of reasons:

1. The laboratory is rated "Good" under the current WASP performance criteria set by the Health and Safety Laboratory.[ix] Under the new, tighter criteria to be introduced in April 2009, the laboratory is still considered to be "Acceptable" based on data recorded between April 2007 and April 2008.
2. Richmondshire District Council does not carry out its own co-location studies with NO_2 Automatic Monitors. Historically, the bias adjustment figure has been calculated from data obtained from Newcastle City Council and Gateshead Council. As these Local Authorities have decided to continue using this laboratory, Richmondshire wishes to retain the continuity established over the years.
3. Jesmond Dene laboratory has consistently provided a good and reliable service.

It is known that there are systematic differences in the performance of different laboratories and preparation methods of diffusion tubes. Table 2.3 shows the studies that have been used to compare results from diffusion tubes (analysed by the same laboratory as used by Richmondshire District Council) to results of co-located automatic chemiluminesence monitors, where data has been collected for 9 months or more. The results are for 2008 and contain data for the 12 months following those contained in the last Updating and Screening Assessment. Only studies from Gateshead Council were available at the time of writing this report.

From these studies it can be seen that the overall bias (B) over this period is 32.15% (i.e. the diffusion tubes were over-reading by an average of 32.15%). A bias adjustment factor (A) of 0.76 has therefore to be applied (multiplied) to the diffusion tube results for this period.

Table 2.3: 2008 Diffusion Tube Bias and Bias Adjustment Factor Calculated From Diffusion Tube (50% v/v TEA in acetone) / Automatic Chemiluminesence Monitor Co-location Studies[x]



Microsoft Excel - bias adjustment table

File Edit View Insert Format Tools Data Window Help

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

Data only apply to tubes exposed monthly and are not suitable for correcting individual short-term monitoring periods
Whenever presenting adjusted data, you should state the adjustment factor used

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

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Step 1:	Step 2:	Step 3:									
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 sho								
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								
Analysed By[1]	**Method** To undo your selection, choose (All) from the pop-up list	**Year[5]** To undo your selection, choose (All)	**Site Type**	**Local Authority**	**Length of Study (months)**	**Diffusion Tube Mean Conc. (Dm) (µg/m3)**	**Automatic Monitor Mean Conc. (Cm) (µg/m3)**	**Bias (B)**	**Tube Precision[6]**	**Bias Adjustment Fa**	
Jesmond Dene Laboratory	50% TEA in Acetone	2008	R	Gateshead Council	11	44	34	28.2%	P	**0.78**	
Jesmond Dene Laboratory	50% TEA in Acetone	2008	R	Gateshead Council	12	42	32	31.4%	G	**0.76**	
Jesmond Dene Laboratory	50% TEA in Acetone	2008	R	Gateshead Council	12	47	34	36.4%	P	**0.73**	
Jesmond Dene Laboratory	50% TEA in Acetone	2008	R	Gateshead Council	11	40	30	32.6%	G	**0.75**	
Jesmond Dene Laboratory	50% TEA in Acetone	2008		**Overall Factor[3] (4 studies)**				**Use**		**0.76**	

[1] For Casella Stanger/Bureau Veritas (NOT Bureau Veritas Labs) use Gradko 50% TEA in Acetone; for Bureau Veritas Labs and Eurofins use Casella Seal/GMSS/Casella CRE/Bureau Veritas Labs/Eurofins; fo

[2] In this situation it would be reasonable to use data from the nearest year.

[3] Overall factors have been calculated using orthogonal regression to allow for uncertainty in both the automatic monitor and diffusion tube. The uncertainty of the diffusion tube has been assumed to be douk

[4] If you have your own co-location study, please send your data to us, so that it can be included here. If this is not possible, but you wish to combine these factors with your own, select and copy the relevai bias. To obtain a new correction factor that includes your data, average the bias (B) values, expressed as a factor, i.e. -16% is -0.16. Next add 1 to this value, e.g. -0.16 + 1.00 = 0.84 in this example, then te

2.2 Comparison of Monitoring Results with AQ Objectives

The previous rounds of Review and Assessment have identified nitrogen dioxide from road traffic as being the only major pollutant source in Richmondshire. This is therefore the only pollutant which is currently monitored.

2.2.1 Nitrogen Dioxide

The United Kingdom Government and the Devolved Administrations have adopted two Air Quality Objectives for nitrogen dioxide. The first is an annual mean of 40µg/m^3 and the second is a 1-hour mean concentration of 200µg/m^3 not to be exceeded more than 18 times a year. These objectives were to be achieved by the end of 2005. This stems from the European Union First Daughter Directive which includes a 1-hour limit value of 200µg/m^3 not to be exceeded more than 18 times a year and an annual mean limit value of 40µg/m^3. These values do not have to be achieved until 1 January 2010. Only the annual mean is calculated in Richmondshire, as concentrations of nitrogen dioxide have so far been well below the objective.

Automatic Monitoring Data

No automatic monitoring is undertaken in Richmondshire.

Diffusion Tube Monitoring Data

The 2008 diffusion tube results (adjusted for bias) are displayed in table 2.4a. The nitrogen dioxide levels are well below the annual mean objective of 40µg/m^3. Table 2.4b shows a slight downward trend in nitrogen dioxide levels in Richmond in the last 3 years and this is illustrated further in Figure 2 which displays the annual mean NO_2 concentrations since monitoring began in 1995. The data from site R2 (2N) is not bias adjusted before 2001.

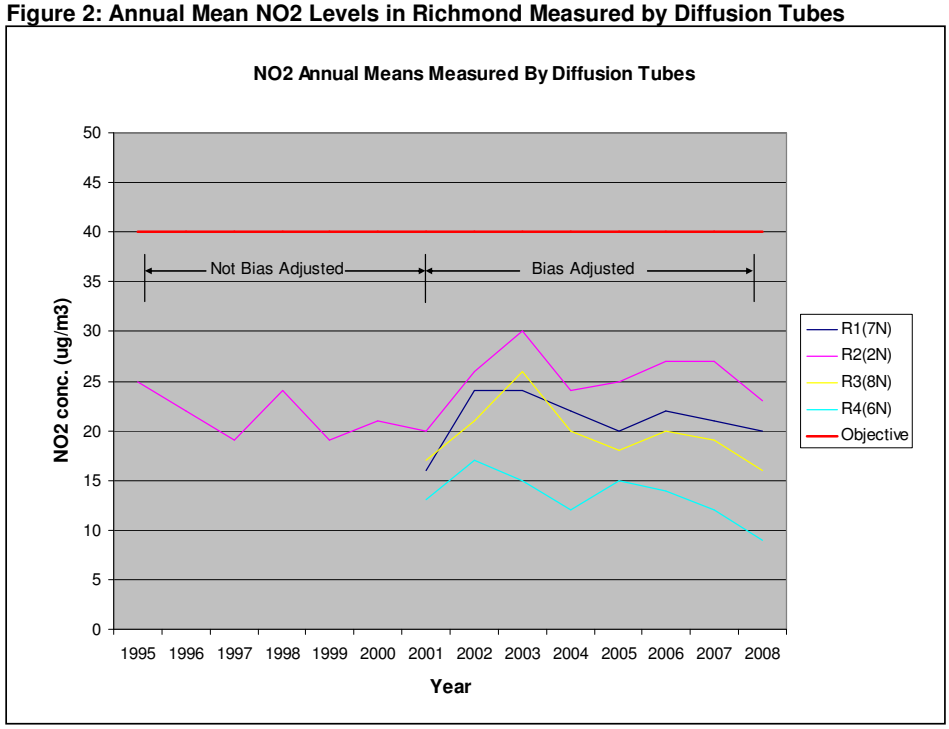
Table 2.4a Results of Nitrogen Dioxide Diffusion Tubes

Site ID	Location	Within AQMA?	Data Capture 2008 %	2008 Annual mean concentrations (µg/m^3) Adjusted for bias Annual Mean Objective 40µg/m^3
R1	38 Victoria Road Richmond North Yorkshire DL10 4UA	N	92	20
R2	5 Queens Road Richmond North Yorkshire DL10 4AJ	N	92	23
R3	Ridgeway Nursery 47 Darlington Road Richmond North Yorkshire DL10 7BG	N	92	16
R4	1 White Rose Cres. Richmond North Yorkshire DL10 7DW	N	100	9

Table 2.4b Results of Nitrogen Dioxide Diffusion Tubes

Site ID	Location	Within AQMA?	Annual mean concentrations(µg/m^3) Adjusted for bias (Factor used shown under each year)		
			2006 (0.86)	2007 (0.79)	2008 (0.76)
R1	38 Victoria Road Richmond North Yorkshire DL10 4UA	N	22	21	20
R2	5 Queens Road Richmond North Yorkshire DL10 4AJ	N	27	27	23
R3	Ridgeway Nursery 47 Darlington Road Richmond North Yorkshire DL10 7BG	N	20	19	16
R4	1 White Rose Cres Richmond North Yorkshire DL10 7DW	N	14	12	9

Figure 2: Annual Mean NO2 Levels in Richmond Measured by Diffusion Tubes



The 2005 objectives for NO_2 were achieved within Richmondshire. Correction factors are used to predict future NO_2 concentrations in years where data is unavailable. The correction factors used are outlined in Table 2.5 and are obtained from Local Air Quality Management Technical Guidance (LAQM. TG(09))[ii].

Table 2.5: Correction Factors to Estimate Annual Average NO_2 Concentrations in Future Years from Measured Data at Roadside Sites[xi]

Year	Correction Factor
2008	0.935
2020	0.544

Table 2.6: Future Projections of Bias Adjusted Annual Mean Measured Nitrogen Dioxide Concentrations (µg/m^3) at the Richmondshire DC Diffusion Tube Sites

	Roadside			Background
	Objective = 40µg/m^3			
	R1 (7N)	R2 (2N)	R3 (8N)	R4 (6N)
2008	20	23	16	9
2020	20x(0.544/0.935) =**12**	23x(0.544/0.935) =**13**	16x(0.544/0.935) =**9**	9x(0.544/0.935)= **5**

Future Projections Based on Factors in Review and Assessment Technical Guidance LAQM.TQ(09), Defra 2009

Table 2.6 shows the future projections for 2020 based on the annual average values from 2008. None of the values obtained exceed, or are likely to exceed the annual mean objective of 40µg/m^3 in 2020. It would seem likely that the downward trend in NO_2 concentrations will continue in Richmondshire. No further action is therefore required for NO_2.

3 Road Traffic Sources

3.1 Narrow Congested Streets with Residential Properties Close to the Kerb

Richmondshire District Council confirms that there are no new/newly identified congested streets with a flow above 5,000 vehicles per day and residential properties close to the kerb, that have not been adequately considered in previous rounds of Review and Assessment.

3.2 Busy Streets Where People May Spend 1-hour or More Close to Traffic

Richmondshire District Council confirms that there are no new/newly identified busy streets where people may spend 1 hour or more close to traffic.

3.3 Roads with a High Flow of Buses and/or HGVs.

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

3.4 Junctions

Richmondshire District Council confirms that there are no new/newly identified busy junctions/busy roads.

3.5 New Roads Constructed or Proposed Since the Last Round of Review and Assessment

A66 Upgrade

During 2006 and 2007, The Highways Agency upgraded the A66 to dual carriageway on sections between Greta Bridge and Stephen Bank and Carkin Moor and Scotch Corner. The majority of the development lies within Richmondshire except for the first 1800 meters from Greta Bridge. The reason for the conversion was to avoid accidents caused by frustrated drivers overtaking slow-moving traffic. No increase in traffic was expected as a result.

An Environmental Statement for the development was produced on behalf of the Highways Agency by Mouchel Parkman of Northallerton, North Yorkshire[xii]. In this statement several locations were predicted as exceeding the government's annual mean air quality objective for nitrogen dioxide[xiii]. The predictions are summarised in Table 3.5.1. The predictions contradict the findings of the 2003[iii] and 2006[vi] Updating and Screening Assessments produced by Richmondshire District Council which concluded no exceedences would occur.

Table 3.5.1: Environmental Statement Predicted Nitrogen Dioxide Levels at Locations Along the A66 Comparing the "With Scheme" to the "Do Minimum" Situation in the Year 2006

Location	2006 Annual Mean NO_2 ($\mu g/m^3$) Objective = 40 $\mu g/m^3$	
	Do Minimum	With Scheme
Grove House	41	36
The Lodge (Hargill)	46	39
Granary Cottage	50	43
Gatherley Moor Farm	50	43
The Lodge (Sedbury)	49	45
Lay-by Cafe	41	33
Vintage Motel	46	39
Scotch Corner Hotel	57	56

In a previous exercise to monitor nitrogen dioxide levels by the A66, Richmondshire District Council placed a diffusion tube at Gatherley Moor Farm for 7 months between January and August 2004. This tube was not part of the National Diffusion Tube Network however, following the Technical Guidance[xiv], the results obtained were extrapolated in the 2007 Progress Report[vii] and showed there was no risk of an exceedence of the annual mean objective for nitrogen dioxide. Feedback on the report by DEFRA suggested further diffusion tube monitoring should take place at strategic locations along the A66 within Richmondshire.

Diffusion tubes were therefore sited on buildings at locations listed in Table 3.5.2 and illustrated on Map 2 along with the other properties identified as potentially vulnerable in the Highways Agency Environmental Statement.

Table 3.5.2: Location Of Diffusion Tubes Along The A66

Location	Distance From A66 (meters)	Grid Reference		Site Ref.
		Easting	Northing	
Grove House	9	410,902	511,462	R5
Gatherley Moor Farm	8	419,207	506,509	R6
Scotch Corner Hotel	22	421,366	505,261	R7

Monitoring began in November 2007 and lasted for 12 months to take account of any seasonal variation. Table 3.5.3 shows the results obtained and Table 3.5.4 shows the results following adjustment with the 2007 bias adjustment factor of 0.79.

Conclusion

The results show there have been no exceedences of the government's annual mean nitrogen dioxide objective. No further action is therefore required for nitrogen dioxide along the A66.

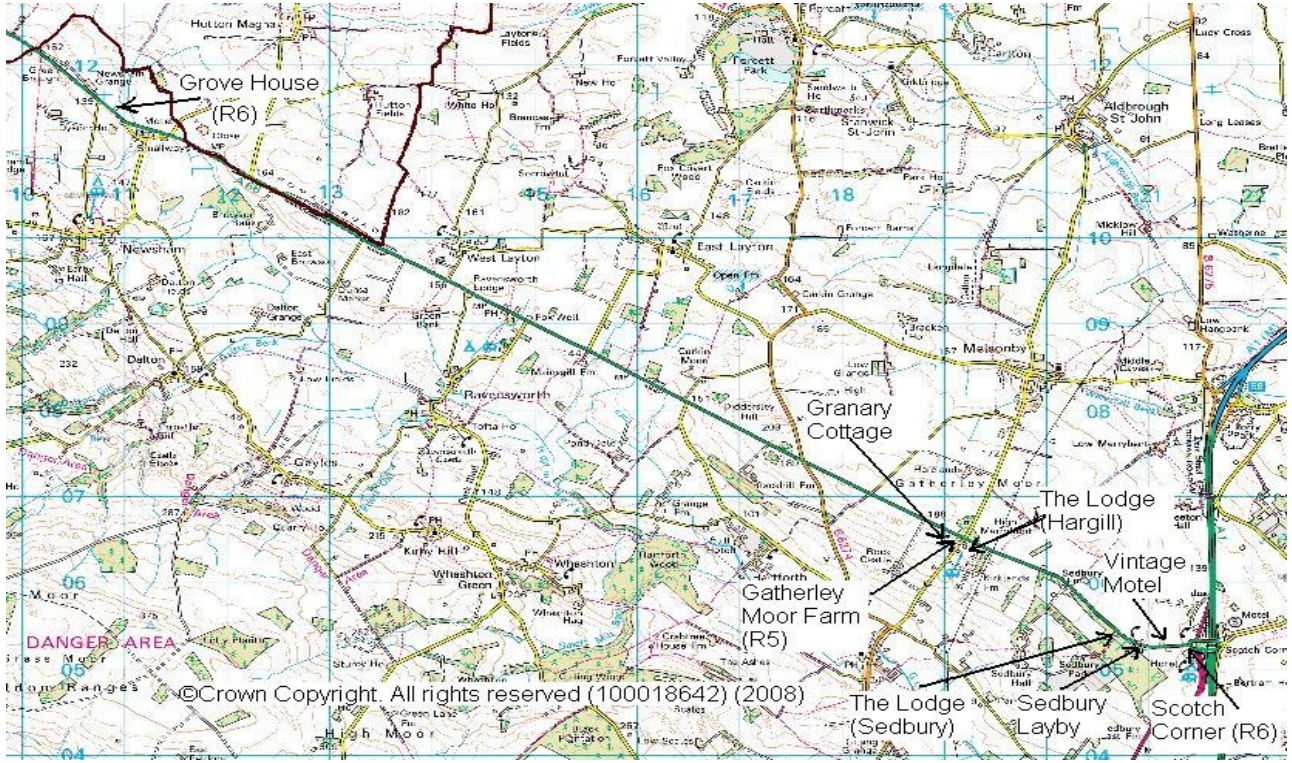
Table 3.5.3: Nitrogen Dioxide Concentrations (µg/m^3) At Locations Along The A66 Measured By Diffusion Tubes.

Date	Annual Mean Objective = 40 µg/m^3		
	Location		
	R5	**R6**	**R7**
November 2007	37	23	27
December 2007	37	28	33
January 2008	32	22	20
February 2008	42	26	35
March 2008	27	15	18
April 2008	38	21	32
May 2008	33	20	36
June 2008	23	19	22
July 2008	28	18	22
August 2008	25	19	21
September 2008	34	20	28
October 2008	14	30	23
Average	**31**	**22**	**26**

Table 3.5.4: Nitrogen Dioxide Concentrations (µg/m^3) At Locations Along The A66 Measured By Diffusion Tubes After Application of Bias Adjustment Factor (0.79)

Date	Annual Mean Objective = 40 µg/m^3 After Bias Adjustment		
	Location		
	R5	**R6**	**R7**
November 2007	29	18	21
December 2007	29	22	26
January 2008	25	17	16
February 2008	33	21	28
March 2008	21	12	14
April 2008	30	17	25
May 2008	26	16	28
June 2008	18	15	17
July 2008	22	14	17
August 2008	20	15	17
September 2008	27	16	22
October 2008	11	24	18
Average	**24**	**17**	**21**

Map 2. Location of Diffusion Tubes Along A66 and Properties Included in Table 3.5.2



Richmondshire District Council

A1 Upgrade

The Highways Agency plans to upgrade the A1 between Barton and Dishforth from 2 to 3 lane carriageway with a view to reducing the number of accidents resulting in serious injuries and fatalities. The section from Barton to the south of Catterick lies within Richmondshire. The following information is taken from the 2006 Environmental Statement A1(M) Dishforth to Barton Improvement prepared on behalf of the Highways Agency by AMEC/McAlpine[xv].

Traffic surveys carried out in 2004 measured daily traffic flows for the A1 between Dishforth and Barton ranging between 49,000 and 55,000 vehicles (Annual Average Daily Traffic). The heavy goods vehicle proportion of the traffic was approximately 24%, which is significantly above the national average for this type of road.

The predicted traffic flows during 2010 (the proposed opening year of the scheme) are between 59,800 and 69,400 within Richmondshire. A summary of the predicted traffic figures for 2010 assuming an optimistic (highest) traffic growth scenario is given below in table 3.5.5.

Table 3.5.5 Traffic Flow Diagrams in 2010 (Opening Year) – Optimistic (high) Forecast.

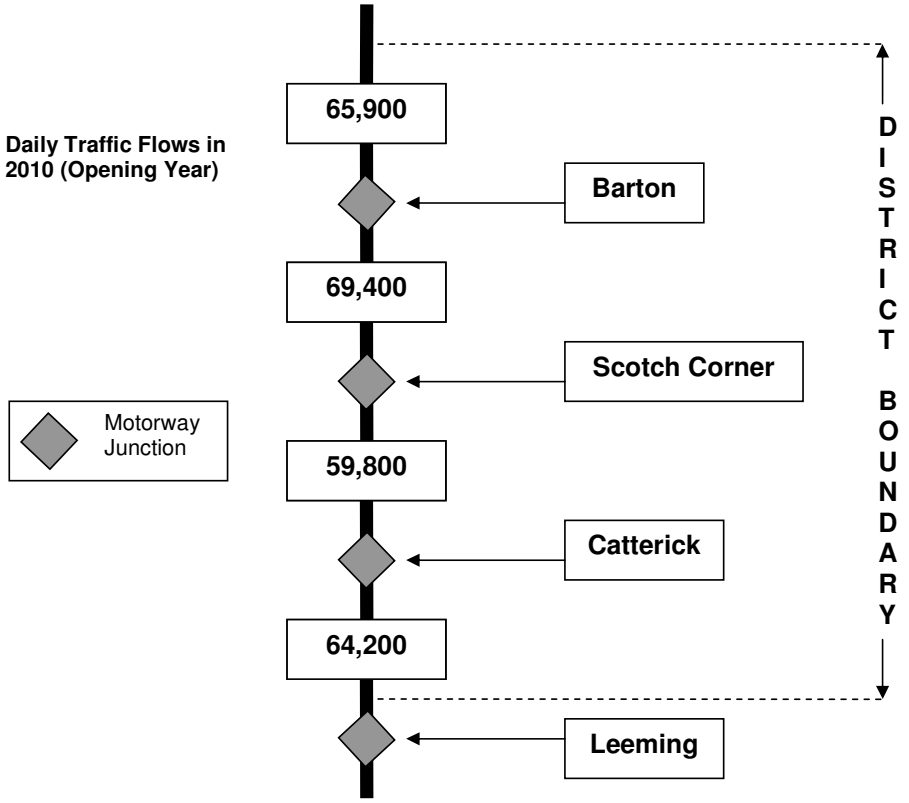


Table 3.5.6: Environmental Statement Predicted Nitrogen Dioxide Levels at Locations Along the A1 Comparing the "With Scheme" to the "Do Minimum" Situation in the Year 2010.

Location	Annual Mean NO_2 (µg/m^3) (Objective = 40 µg/m^3)		
	Base Year 2004	Do Minimum 2010 Prediction	With Scheme 2010 Prediction
29 Honeypot Road A1 Catterick (S) – Catterick (N)	35.96	29.31	27.41
92 Brompton Court A1 Catterick (S) – Catterick (N)	35.64	30.21	29.03
Thorpe House A1 Catterick (S) – Catterick (N)	33.42	27.12	26.69
Summervale A1 Catterick (N) – Scotch Corner	38.44	31.23	24.85
4 Kneeton Cottages, Kneeton Lane A1 Scotch Corner - Barton	19.89	15.61	15.60

Table 3.5.7: Environmental Statement Predicted PM10 Levels at Locations Along the A1 Comparing the "With Scheme" to the "Do Minimum" Situation in the Year 2010

Location	Annual Mean PM_{10} (µg/m^3) (Objective = 40 µg/m^3)		
	Base Year 2004	Do Minimum 2010 Prediction	With Scheme 2010 Prediction
29 Honeypot Road A1 Catterick (S) – Catterick (N)	24.29	20.12	19.76
92 Brompton Court A1 Catterick (S) – Catterick (N)	24.10	20.44	20.00
Thorpe House A1 Catterick (S) – Catterick (N)	22.85	19.20	19.44
Summervale A1 Catterick (N) – Scotch Corner	25.73	20.97	18.52
4 Kneeton Cottages, Kneeton Lane A1 Scotch Corner - Barton	16.70	15.25	15.28

The Highways Agency Design Manual for Roads and Bridges (DMRB Vol. 5) was used by AMEC/McAlpine to predict the nitrogen dioxide and PM10 levels in 2010 (the opening year of the scheme) from results calculated from the traffic volumes recorded in 2004 (the base year). The predictions were calculated for properties that would be nearest to the A1 upon completion of the

scheme and are summarised in Tables 3.5.6 and 3.5.7. The locations of these properties are indicated on Map 3. The DMRB spreadsheet was not included in the Environmental Statement and is therefore not presented in this USA.

Tables 3.5.6 and 3.5.7 contain predicted concentrations for NO_2 and PM10 both with the scheme and without (do minimum). No exceedences of the government's annual mean nitrogen dioxide or PM10 objectives are expected whether the scheme takes place or not. A similar assessment took place for carbon monoxide, benzene and 1,3-butadiene again with no exceedences of the government's objectives expected. There is therefore no need for any further action with regard to the proposed A1 upgrade.

Map 3: Locations of Properties by the A1 Assessed in Highways Agency Environmental Statement

Richmondshire District Council has assessed new/newly identified roads meeting the criteria in Section A.5 of Box 5.3 in TG(09), and concluded that it will not be 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 that meet the specified criteria within the Local Authority area.

5 Industrial Sources

5.1 Industrial Installations

5.1.1 New or Proposed Installations for which an Air Quality Assessment has been Carried Out

Richmondshire District Council confirms that there are no new or proposed industrial installations for which planning approval has been granted within its area or nearby in a neighbouring authority.

5.1.2 Existing Installations where Emissions have Increased Substantially or New Relevant Exposure has been Introduced

Richmondshire District Council confirms that there are no industrial installations with substantially increased emissions or new relevant exposure in their vicinity within its area or nearby in a neighbouring authority.

5.1.3 New or Significantly Changed Installations with No Previous Air Quality Assessment

Richmondshire District Council confirms that there are no new or proposed industrial installations for which planning approval has been granted within its area or nearby in a neighbouring authority.

5.2 Major Fuel (Petrol) Storage Depots

There are no major fuel (petrol) storage depots within the Local Authority area.

5.3 Petrol Stations

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

5.4 Poultry Farms

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

6 Commercial and Domestic Sources

6.1 Biomass Combustion – Individual Installations

One appliance was identified as burning biomass between 50kW and 20MW units within Richmondshire. It is located at Ravensworth Nurseries, Ravensworth, a village about 6 miles north of Richmond with a population of approximately 240. The plant is also located about 750 meters south west of the A66. The location is illustrated in Map 4. The plant is a 2 MW Talbot C8 Boiler and is located inside a prefabricated building with a stack that protrudes through the top of the roof of the building. The relevant parameters are summarised in Table 6.1 below. The maximum emission rates were obtained from "Technical Guidance: screening assessment for biomass boilers" Abbott et al (July 2008).[xvi] The appliance comes under the category of an Advanced Automatic Wood-burning Boiler as it has a fully automatic system for feeding of pellet / chipped fuels and for supply of combustion air, which is distributed into primary and secondary air. The boiler is equipped with a smaller pellet / chipped wood storage, which is fuelled by an automatic system from larger chamber storage. The pellets are introduced by screw into burner. These boilers are characterised by a high efficiency (usually above 80%) and their emissions are comparable to those of liquid fuel boilers.

Map 4: Location of Biomass Plant at Ravensworth Nurseries, Ravensworth, Richmond.

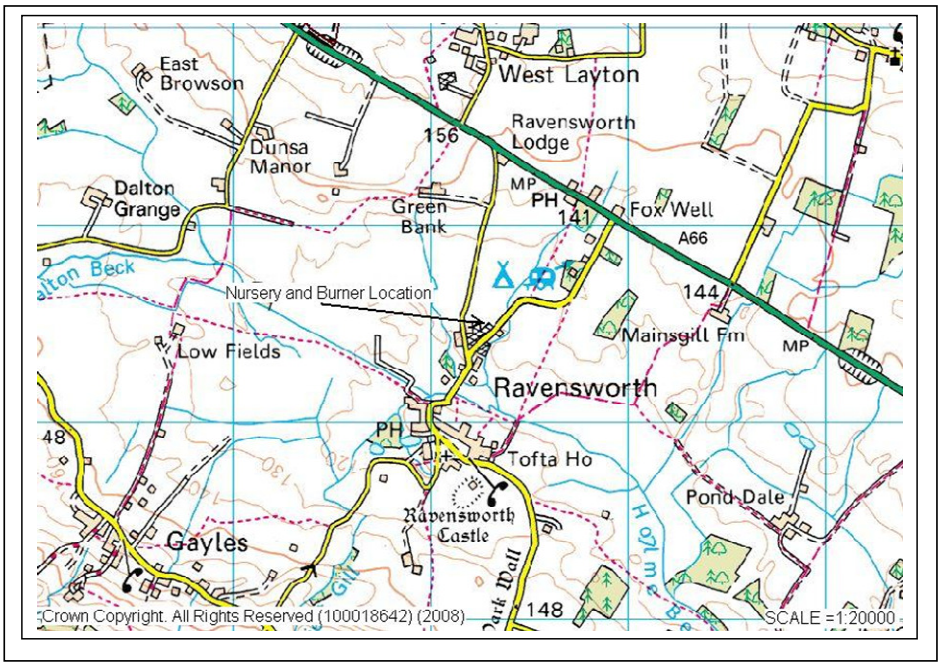


Table 6.1: Parameters of Ravensworth Nursery Biomass Combustion Plant

Talbot C8 Boiler	Output = 2 MW (2000kW)
Stack Diameter	0.5m
Stack Height (including building)	10m
Building Height	7m
NOx Emission Factor	150g/GJ
PM10 Emission Factor	66g/GJ
Maximum NOx Emission Rate	= Emission Rate (g/GJ) x Boiler Output (kW) x 10^{-6} = 150 x 2000 x 10^{-6} = 0.3g/s
Maximum PM10 Emission Rate	= Emission Rate (g/GJ) x Boiler Output (kW) x 10^{-6} = 66 x 2000 x 10^{-6} = 0.132g/s
Background NO_2 Concentration[xvii]	8 µg m^{-3}
Background PM10 Concentration[xvii]	11 µg m^{-3}

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

Figure 3 shows the 2009 background concentrations of NO_2 and PM10 in Richmondshire.[xvii]

PM10

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

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

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

For this biomass combustion plant E_A = 0.006g/s which is below the threshold emission rate for the 90^{th} percentile of 24-hour mean ground-level concentrations of 1 µg m^{-3} as illustrated on the relevant nomogram. No further action is therefore needed for PM10.

Nitrogen dioxide, annual mean

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

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

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

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

Nitrogen dioxide, 1 hour average

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

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

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

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

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

6.2 Biomass Combustion – Combined Impacts

The effect of solid fuel burning on PM10 levels has already been considered in previous review and assessments. Within the District of Richmondshire there are a number of villages which do not have a mains gas supply and therefore may have a higher than average density of households burning solid fuel. Of these villages, those with the highest housing densities are Reeth and Middleham which both have over 300 properties in a single 500m x 500m area. However, the background PM_{10} concentrations in these areas are low (less than 15 µg/m^3 in 2004) and therefore according to the nomograms provided in the Technical Guidance[xiv], even if all of these households used coal, it would be unlikely that there would be an exceedence of the objectives.

The presence of the biomass combustion plant at Ravensworth Nurseries has not been considered however. The following method of calculating the combined impacts of PM10 emissions from biomass combustion is taken from the Technical Guidance TG(09).

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

- 1 Automatic wood-fired boiler with emissions of PM10 per hectare of service sector floorspace of 295kg/year.
- 13 domestic properties (assume worst-case wood-burning fireplaces) with emissions of PM10 per household of 27.43kg/year.

.
The floorspace at Ravensworth Nurseries has been estimated using GIS as being approximately 30 Hectares which gives total PM10 emissions of 295 x 30 = 8850kg/year.

The sum of the PM10 emissions from the domestic properties is 27.43 x 13 = 356.59kg/year.

Therefore the total PM10 emissions for the 500m x 500m area is:

8850 + 356.59 = 9206.59kg/year.

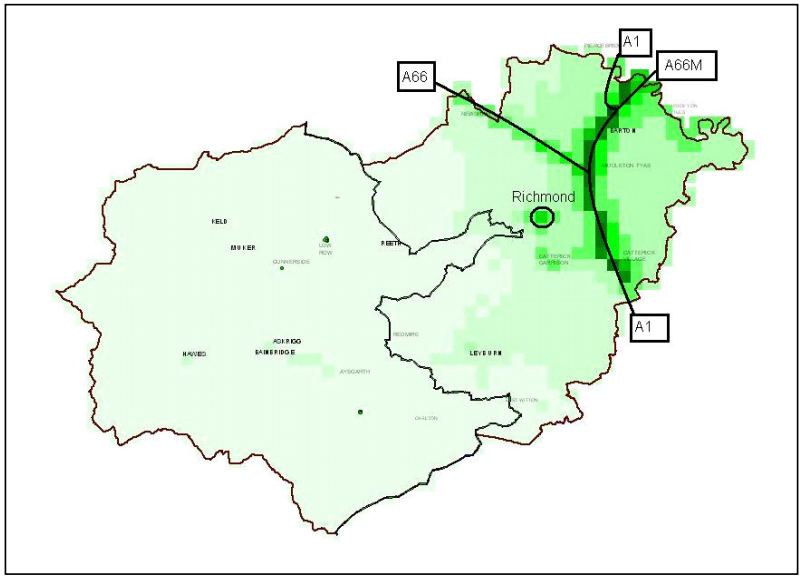
As already mentioned in Section 6.1, the background PM10 concentration at this location is11 µg m^{-3}.

Even assuming the whole area is occupied and not adjusting this figure for percentage area cover as suggested in TG(09), the source does not exceed the relevant nomogram. No further action is therefore required for PM10 at this location.

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

Figure 3: Approximate Pictorial Representations of Projected Annual Mean Background Concentrations in Richmondshire

Projected 2009 Background NO_2 Concentrations in Richmondshire ($\mu g/m^3$)



Scale for both maps ($\mu g/m^3$)

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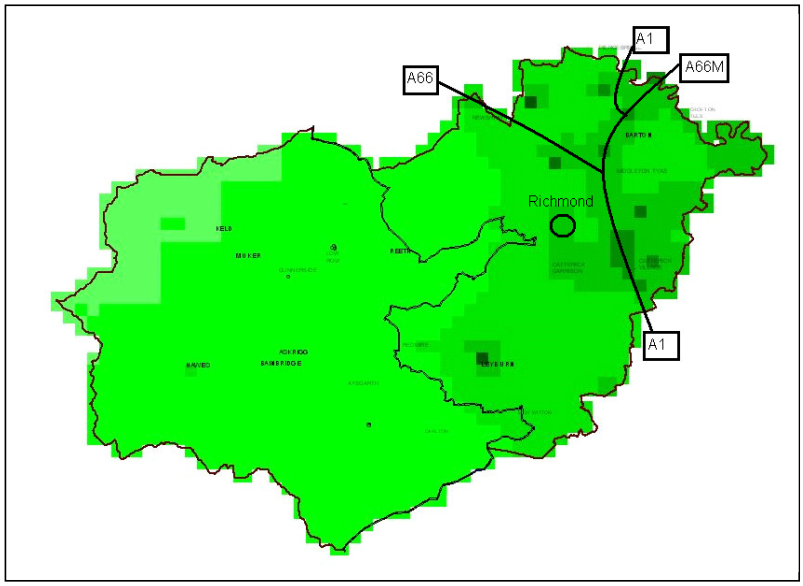
Projected 2009 Background PM_{10} Concentrations in Richmondshire ($\mu g/m^3$)



6.3 Domestic Solid-Fuel Burning

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

7 Fugitive or Uncontrolled Sources

Richmondshire District Council confirms that there are no potential sources of fugitive particulate matter emissions in the Local Authority area.

8 Conclusions and Proposed Actions

8.1 Conclusions from New Monitoring Data

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

8.2 Conclusions from Assessment of Sources

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

8.3 Proposed Actions

The Updating and Screening Assessment has not identified any need to proceed to a Detailed Assessment in any area. As no AQMA's exist in Richmondshire, the next course of action will be to produce the 2010 Progress Report.

9 References

[i] Richmondshire District Council (1999) Stage 1 Air Quality Review and Assessment.
[ii] Laxen, D (December 1999) Air Quality Monitoring in Richmondshire
[iii] Richmondshire District Council (2003) Updating and Screening Assessment of Air Quality in the District of Richmondshire
[iv] Richmondshire District Council (2005) Detailed Assessment of Sulphur Dioxide Emissions from Domestic Solid Fuel Sources
[v] Richmondshire District Council (2005) Air Quality in the District of Richmondshire Progress Report
[vi] Richmondshire District Council (2006) Updating and Screening Assessment of Air Quality in the District of Richmondshire.
[vii] Richmondshire District Council (2007) Air Quality in the District of Richmondshire – Progress Report.
[viii] Richmondshire District Council (2008) Air Quality in the District of Richmondshire – Progress Report.
[ix] AEA (November 2008) WASP – Annual Performance Criteria for NO_2 Diffusion Tubes used in Local Air Quality Management (LAQM), 2008 onwards and Summary of Laboratory Performance in Rounds 97 – 101.
[x] Spreadsheet of Diffusion Tube Bias Adjustment Factors http://www.uwe.ac.uk/aqm/review/
[xi] Defra, (February 2009), Local Air Quality Management, Technical Guidance LAQM.TG(09).
[xii] Mouchel Parkman (September 2002) Environmental Statement A66 Greta Bridge to Stephen Bank and Carkin Moor to Scotch Corner.
[xiii] DETR (January 2000), The Air Quality Strategy for England, Scotland, Wales and Northern Ireland.
[xiv] Defra, (February 2003), Local Air Quality Management, Technical Guidance LAQM.TG(03).
[xv] AMEC/McAlpine Joint Venture (2006) Environmental Statement A1(M) Dishforth to Barton Improvement Volume 1.
[xvi] Abbott J (July 2008) Technical Guidance: Screening Assessment for Biomass Boilers. AEA Energy and Environment.
[xvii] http://www.airquality.co.uk/archive/laqm/tools.php