



Environment Act 1995 Local Air Quality Management Detailed Assessment – Hipperholme

**November
2012**

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Corrections and Appendix C added March 2013

Introduction

The Council's 2011 Progress report [PR2011] and 2012 Updating and Screening Assessment [USA12] identified that Hipperholme required a detailed assessment for traffic related nitrogen dioxide.

The area considered consists of the main road segments and streets around the junction of the A58 Leeds Road, Brighthouse Road, Wakefield Road and Halifax Road. Monitoring carried out in 2000 and 2001 [STR01] led the Council to the conclusion that nitrogen dioxide concentrations were unlikely to exceed the objectives. Limited monitoring continued and the diffusion tube HH1 was established on residential property. This tube showed an annual mean concentration of $42\mu\text{gm}^{-3}$ (reported in [USA09]) and has continued to show annual means greater than the objective. The Council concluded that more data was required to determine the likely extent of the exceedences.

Limited resources meant that the further investigation had to take place in two stages. The first was the deployment of diffusion tubes in streets not directly facing onto the main roads, in order to investigate whether the affected area was confined to the main roads.

The second stage was to place tubes close to relevant receptors along the main roads.

The report sets out the results of monitoring using diffusion tubes. The initial findings of the earlier reports are summarised and the monitoring results are set out. The objective considered in this report is the annual mean NO_2 concentration. The one-hour nitrogen dioxide objective is not believed to be relevant in this location.

1: Junction of Halifax Road and Leeds Road

1.1 Conclusion of Updating and Screening Assessment

The 2012 updating and screening assessment, considering nitrogen dioxide, stated that

Hipperholme

Certain areas have seen an increase in the annual mean, notably HH1 at Hipperholme, where changes to the traffic controls have been made. The tubes HH-NV, HH-GS, HH-WG and HH-BR were deployed in 2011 to get a better picture of the mean concentrations in the streets just behind the main roads, and it was found that the concentrations fell below the objective at these locations. Further changes to the junction, including 'intelligent' traffic light phasing, are planned for the very near future, and three further diffusion tubes have been deployed around the main road junction. These tubes, HH-LB, HH-LT and HH-LR are on or close to residential properties fronting onto the main roads close to the junction and should give a clear indication of the boundary of any AQMA.

1.2 Monitoring during 2011/12

The Council has undertaken monitoring using diffusion tubes shown in Map 1, which also shows the layout of the traffic light controlled junction. Tubes set back from the main road in nearby streets were not all fixed close to relevant receptors because the intention was to get an idea of the geographical extent of the elevated concentrations.

	J	F	M	A	M	J	J	A	S	O	N	D	mean
HB3 BG	34	41	34	31	23	22	22	18	26	31	46	32	30
HQ8	44	63	71	47	23	27	22	23	26	35	48	22	38
	39	52	52.5	39	23	24.5	22	20.5	26	33	47	27	33.79
Mean June to December													28.57
Period correction factor													1.18

In these tables 'annualised' means corrected to an annual mean using the period correction factor. There are no continuous analysers close to Hipperholme, and therefore diffusion tubes have been used to annualise the data. HB3BG is a background tube at Hebden Bridge, while HQ8 is a roadside tube also located in Hebden Bridge. The mean concentrations at these positions is below the annual mean objective, and so we can exclude these and similar locations from the zone of exceedence.

We now consider the tubes deployed along the main roads in 2012. The data for these tubes is shown in Table 2. The data was provisionally period corrected using data shown in Table 2A. The bias correction factor $f = 0.84$ from the latest spreadsheet was used.

	J	F	M	A	M	J	J	A	S	O	N	D	Period mean	annualised	Bias corrected
HH-LR			56	61	52	42	42	46	42				49	54	45
HH-LB			62	73	60	47	42	52	33				53	58	49
HH-LT			80	55	50	49	50	51	48				55	60	51

	J	F	M	A	M	J	J	A	S	O	N	D	annual mean	Period mean	Period factor
HB6	63	62	58	47	41	44	36	43	43	50	61	52	50	44.8	1.12
HTA H	64	53	53	52	40	48	38	37	40	45	49	48	47	44.7	1.07
CS2	58	54	59	45	33	36	36	43	42	49	56	46	46	42.0	1.10
SB3	68	74	68	59	46	50	46	47	48	54	83	45	57	52.7	1.10
Period correction factor (mean)															1.09

These estimates indicate that the boundary of the zone of exceedence includes the rows of properties on which the tubes are located.

Diffusion tube HH1 was exposed for a full 12 months and the mean nitrogen dioxide concentration was measured to be $57\mu\text{g}\text{m}^{-3}$ (raw), which gives a provisional bias corrected concentration of $43\mu\text{g}\text{m}^{-3}$. This is based on the local correction factor and is subject to revision when the 2012 bias correction spreadsheet is available from DEFRA.

Part 2 Modelling

Using the preliminary results from the diffusion tubes described in Part 1, the Council set about modelling the mean concentrations due to traffic. Traffic counts and queue length observations provided by Highways Engineering were used to build the model in ADMS-Urban. The estimated traffic flows initially gave modelled levels around 30% lower than the measured values, and this is believed to be due to the following factors.

- Traffic approaching the junction can queue for a long time, with episodes of acceleration and slowing, which are difficult to reproduce in the model.
- Detailed traffic surveys carried out in Calderdale have shown that the fleet composition is not well represented by that underlying the ADMS-Urban model. Consequently the model is unlikely to reproduce the monitored concentrations.
- Related to this is the fact that the ADMS-Urban model uses emission factors that underestimate the primary NO₂ emissions from heavy vehicles, and these vehicles form a significant proportion of the vehicles passing through the junction (up to 9%).

To take account of these factors the proportion of HGVs was taken to be higher than that actually recorded, and the model was run with the aim of reproducing the measured values at the diffusion tube locations (see Paragraph A3.227 of [TG09]). The model parameters and output are presented in Appendix C.

Receptor name	X(m)	Y(m)	Z(m)	modelled	Estimated from measurements
HH1	412617	425502	0	50	51
HH_LR	412540	425492	0	49	45
HH_LB	412429	425478	0	46	49
HH_LT	412451	425435	0	43	51
CS	412468	425432	0	43	-

CS was a receptor point used in the model but where no diffusion was located. The greatest discrepancy is at the diffusion tube on Bradford Road (HH-LT), where the model under-predicts the measured concentration. It was felt that further adjustment of the model would be difficult to justify, and so this version was used to determine the extent of the area of exceedence.

Part 3 Other nitrogen dioxide sources in Hipperholme

There are no Part B combustion or incineration installations in this part of Hipperholme. A powder coating installation using gas fired ovens is located 500m to the southeast of the junction, but the prevailing wind is westerly and this installation is not believed to influence the local mean concentrations of nitrogen dioxide. The Council is not aware of any other processes carried out in the area that would contribute to nitrogen dioxide levels, and there has not been a noticeable increase in the use of biomass and alternative fuels in the area.

Those diffusion tubes located away from the main roads do not indicate other sources of nitrogen dioxide in these areas.

Part 4 Summary and Conclusions from modelling and monitoring

4.1 Summary of findings

Monitoring was undertaken to establish the annual mean NO₂ concentrations for periods in 2011 and 2012, and determine whether the air quality objective is likely to be exceeded. Several representative monitoring locations were chosen, and the results of monitoring show that the annual mean concentrations were above the objective annual mean objective at locations close to the main roads.

4.2 Discussion of the use of diffusion tubes

It was not possible to locate an automatic analyser in this area due to cost and space constraints. Sufficient diffusion tubes were used to give a clear indication of the extent of the area over which the annual mean nitrogen dioxide concentration is likely to be exceeded and where there is relevant exposure. The monitoring data has been supplemented by modelling to help define the extent of the road traffic contribution to the pollution.

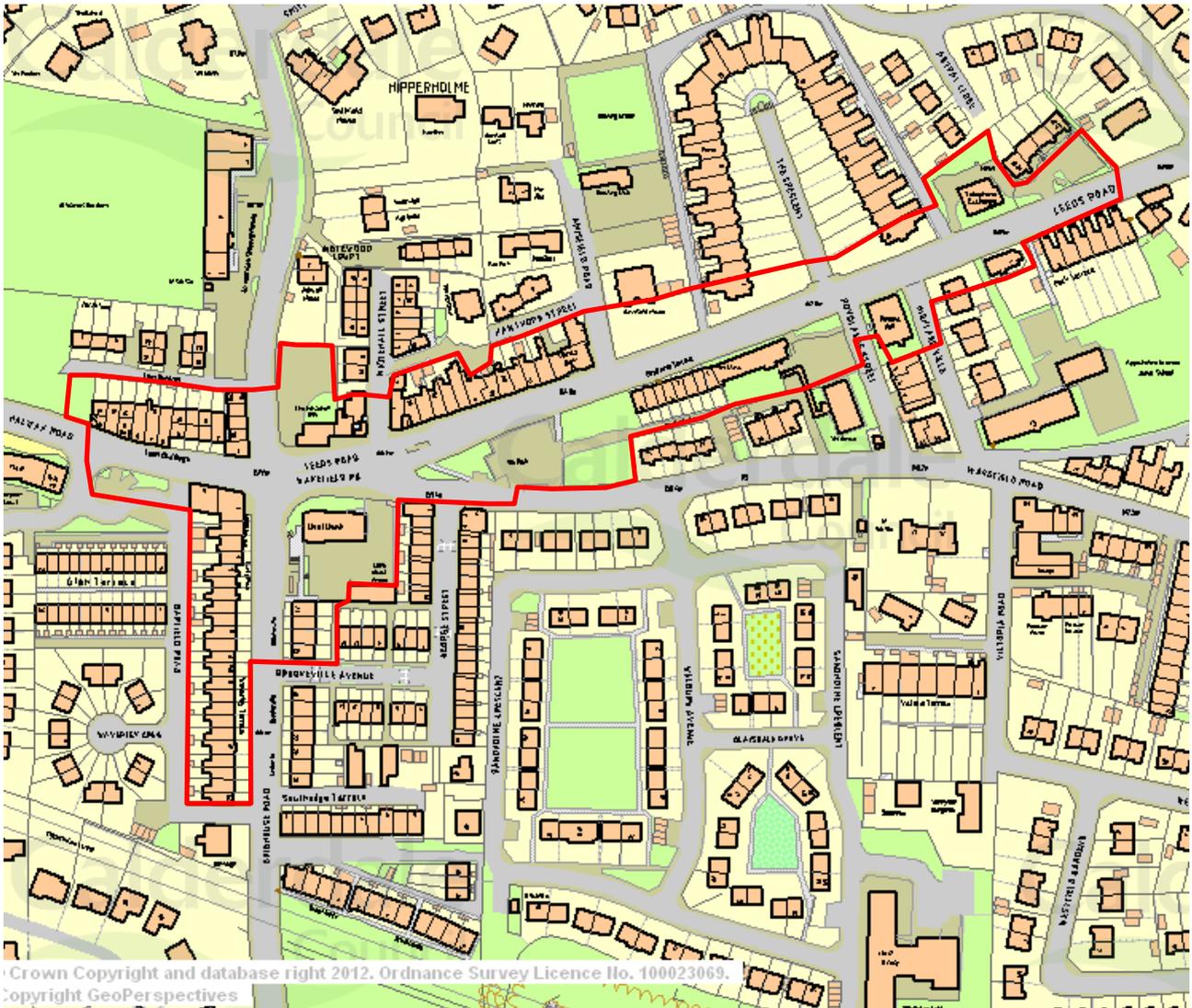
4.3 Estimate of population exposure

It is estimated that the number of people living in the area of exceedence is approximately 100 to 150 living in approximately 60 residential properties.

Part 5 Proposal to declare an air quality management area

The results of monitoring and modelling indicate that the annual mean objective of 40mgm⁻³ is being, and is likely to continue to be, exceeded. The Council must therefore declare an air quality management area after consultation [PG09].

The Council proposes to declare an area around the junction of Leeds Road, Halifax Road, Brighthouse Road and Denholme Gate Road, taking in properties adjacent to the road as indicated by the monitoring and modelling results. The proposed boundary of the area is shown in Map 2. At this stage the boundary is indicative of the extent of the area and will be refined taking account of consultee responses.



Map 2: proposed boundary of air quality management area (provisional)

The following properties fall within the proposed boundary:

- 1 to 18 Lees Buildings, Halifax Road
- 27a to 30 Lees Buildings, Halifax Road
- The Whitehall Public House, Leeds Road
- The Veg Shack and adjacent garage, Leeds Road/ Whitehall Street
- Yum Sing Takeaway, Whitehall Street
- 1 and 2 Whitehall Street
- 1 to 13 inclusive Leeds Road
- 1 to 9 Hawthorne Street (odd numbers only)
- 1 The Crescent and 28 The Crescent
- Telephone Exchange and grounds, Leeds Road
- Rock House, Leeds Road
- 6 Highland Ville
- Masonic Lodge, Roydlands Street
- Pharmacy and clinic, Kos Clinic, Roydlands Street
- 1 to 8 Roydlands Terrace, Leeds Road
- Land at Wakefield Road, including car park

Christ Church, Brighouse Road
15 to 21 Brookville (odd numbers only), Brighouse Road
1 to 4 Linden Terrace, Brighouse Road
5 to 7 Trinity Place, Brighouse Road
8 to 23 Waverley Terrace, Brighouse Road
Whitehall Chambers, Halifax Road

References

- [PG09] Local Air Quality management Policy Guidance LAQM.PG(09), DEFRA 2009
- [PR11] Progress Report 2011, Calderdale MBC, 2011
- [STR01] Stage 3 Report, Calderdale MBC, 2001
- [TG09] Local Air Quality management Technical Guidance LAQM.TG(09), DEFRA 2009
- [USA09] Updating and Screening Assessment 2009, Calderdale MBC, 2009
- [USA12] Updating and Screening Assessment 2009, Calderdale MBC, 2012

Contact details

If you would like to discuss this report or any other aspect of Air Quality Management in Calderdale please contact Ryan Carroll or Tommy Moorhouse at

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Appendices

Appendix A: Diffusion tube corrections used in this report

Diffusion Tube analysis

The Council uses tubes supplied and analysed by West Yorkshire Analytical Services. The preparation method is 50% TEA in acetone.

Factor from Local Co-location Studies (if available)

At the time of writing no bias correction factor for 2012 was available. The factor in the latest bias correction spreadsheet has been used in this report.

Period corrections

Due to the constraints on the number of diffusion tubes available for this study, the tubes were deployed in two sets, one from June to December 2011, the other from March to August 2012. It was necessary to adjust each of the period results to estimate the annual mean concentration, and the procedure is set out in Section 1.2 of the report.

Appendix B: QA/QC of diffusion tube monitoring

These procedures have been reported in the Updating and Screening Assessment 2012.

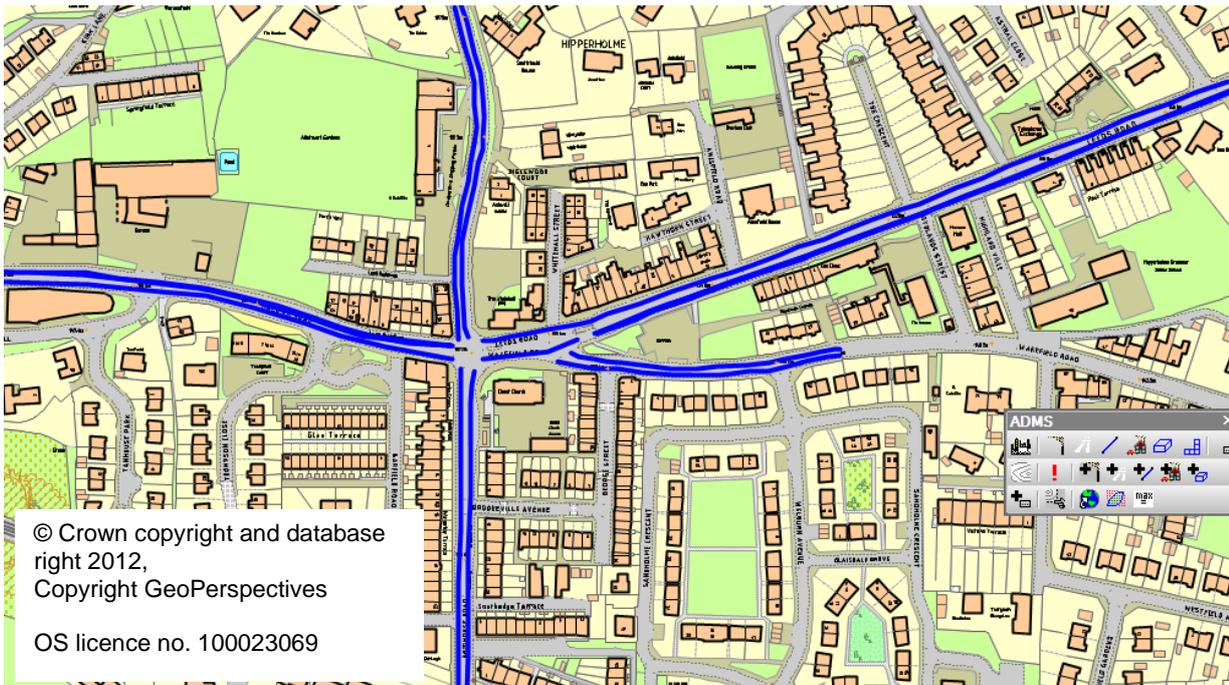
Appendix C: ADMS Urban model

The queue length and traffic volume data was derived from studies carried out by Calderdale Council's Highways Section. The queues were broken up for modelling purposes into 17 segments, shown on Map A1 below.

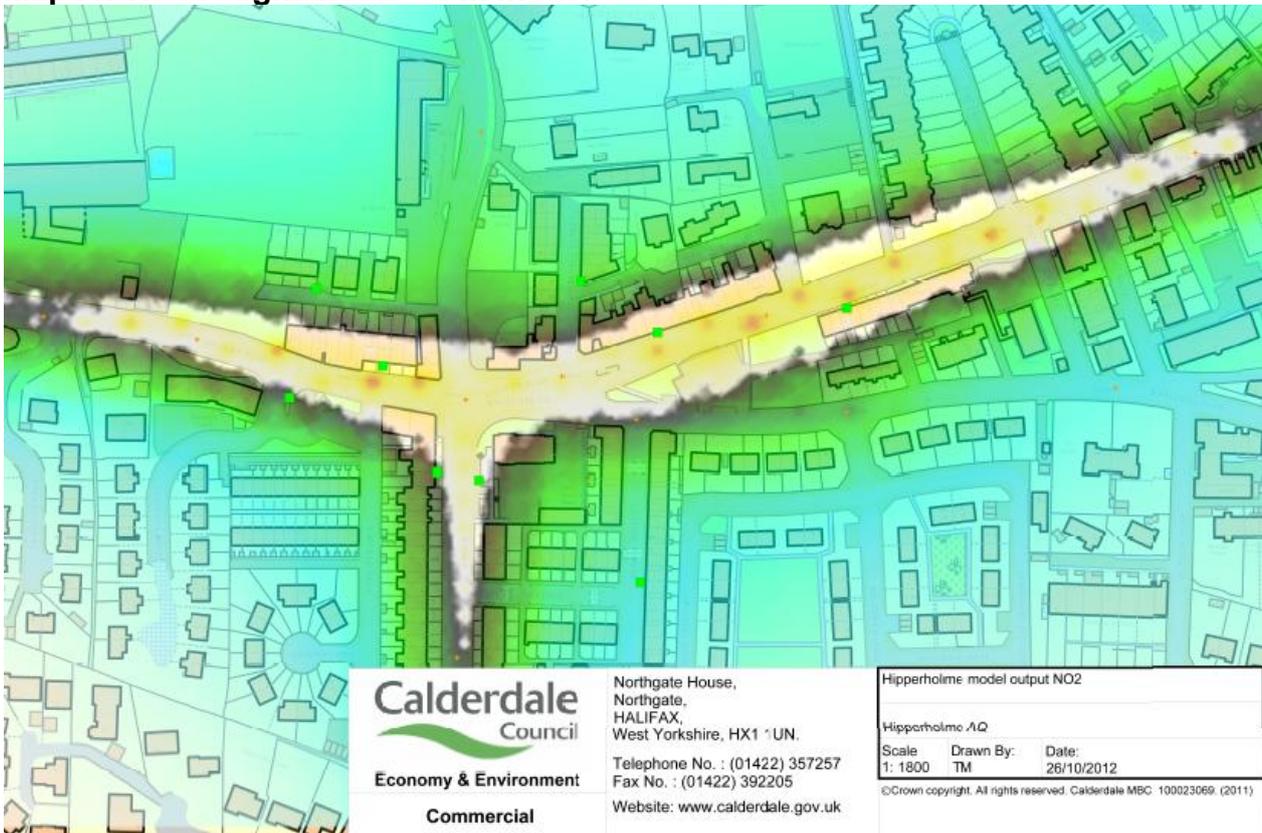
Background concentrations of NO_x (36µgm⁻³) and NO₂ (23µgm⁻³) were taken from the maps available on Defra's air quality website, and the ozone concentration (40µgm⁻³) was estimated from continuous monitoring data from the Barnsley Gawber air quality monitoring station, an urban background site.

Meteorological data for 2012 was not available, and data from Bingley for 2007 was used. As a cross check other model runs were undertaken using data from Bingley for other available years, and the difference was not found to be significant.

Map A2 shows the model output used to delineate the provisional AQMA boundary.



Map A1 Road segments used in model



Map A2 Model output, October 2012

The pale yellow inside the black line represents the area exceeding the air quality objective.

Note added March 2013 A new version of ADMS-Urban, with updated emission factors, was released after this report was first published. More monitoring results for 2012 have also become available. The new model has been run and verified against the monitoring results, and the monitoring will be reported in the 2012 Progress Report.

Appendix D: More information about air quality

More information about the management of air quality in Calderdale can be found on the website <http://www.calderdale.gov.uk/environment/pollution/air-quality/index.html> , and maps showing the locations of diffusion tubes can be found at Calderdale Council's Maps online site: <http://map.calderdale.gov.uk/connect/?mapcfg=Pollution> .

Defra's air quality pages can be found at www.defra.gov.uk/environment/quality/air/air-quality/

If you would like this information in another format or language, please contact: 01422 392307

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