

Part IV Environment Act 1995

Review and Assessment of Air Quality Round 2

**Detailed Assessment of nitrogen dioxide and PM₁₀
(November 2004)**

Air Quality

DETAILED ASSESSMENT (NOVEMBER 2004)

CONTENTS

SUMMARY	3
REVIEW AND ASSESSMENT OF NITROGEN DIOXIDE.....	4
REVIEW AND ASSESSMENT OF PM ₁₀	8

SUMMARY

This document has been produced in response to the requirements of the Welsh Assembly Government for a second round of the review and assessment of air quality. This review under part IV of the Environment Act 1995 consists of two stages. The first stage is an updating and screening assessment of all seven pollutants designated for the purposes of local air quality management, which has been completed. The second stage is a detailed assessment of individual pollutants if the first stage screening assessment indicates that it is needed.

The previously submitted Updating and Screening Assessment (Nov 2003) identified that detailed assessments were required for the pollutants nitrogen dioxide and PM₁₀.

The updating and screening assessment of nitrogen dioxide showed that for one site, Victoria Gardens, Neath, nitrogen dioxide measurements increased sufficiently during 2002, so as to appear to exceed the annual average (objective level) for this substance (40 µg/m³). The diffusion tube was located on a lamp post at kerbside. Additional diffusion tubes have therefore been sited in the vicinity of this location. One on a lamp post at the junction and two on the façades of properties on either side of the junction. Six months worth of data has been collected at these new sites and this shows that it will not be necessary to declare an Air Quality Management Area in respect of nitrogen dioxide.

The previous review and assessment of PM₁₀, coincided with a period of time when one of the confirmed significant local sources of PM₁₀ was out of commission. Since this time this source, blast furnace no. 5 at the Corus Port Talbot steelworks, has undergone rebuilding and upgrading (including the provision of cast-house fume arrestment) following an explosion at the works in November 2001. Further monitoring was carried out within the existing Taibach/Margam air quality management area to assess if the improvements carried out have been effective in abating low level fugitive emissions and also to identify whether the objective level for PM₁₀ was likely to be met by 31st December 2004. The results showed that the PM₁₀ levels increased following the re-commissioning of the blast furnace, but not to levels as high as those before the furnace exploded. The air quality management area will remain in force since monitoring shows that the objective level for PM₁₀ was unlikely to be met by 31st December 2004.

Detailed assessment of nitrogen dioxide

Introduction

The Government and Devolved Administrations have adopted two Air Quality Objectives for nitrogen dioxide. An annual mean concentration of 40 µg/m³ and a 1-hour mean concentration of 200 µg/m³ not to be exceeded more than 18 times per year. Both objectives are to be achieved by the end of 2005.

In addition, the first Air Quality Daughter Directive also sets limit values for nitrogen dioxide, which have been translated into UK legislation. A 1-hour limit of 200 µg/m³ applies, not to be exceeded by more than 18 times per year. An annual mean limit value of 40 µg/m³ also applies, both to be achieved by the 1st January 2010.

Detailed assessment

The checklist approach suggested by Defra for the Updating and Screening Assessment (USA) has been used again for the Detailed Assessment. It also takes into account revised bias correction factors and additional diffusion tube sites since the USA was completed. The checklist is shown below:

Box 1: Summary of the Updating and Screening checklist for nitrogen dioxide	
Reference No.	Source, location or data that need to be assessed
A	Monitoring data outside an AQMA
B	Monitoring data within an AQMA
C	Narrow congested streets with residential properties close to the kerb
D	Junctions
E	Busy streets where people may spend 1-hour or more close to the traffic
F	Roads with high flow of buses and/or HGVs
G	New roads constructed or proposed since first round of review and assessment
H	Roads close to the objective during the first round of review and assessment
I	Roads with significantly changed traffic flows
J	Bus stations
K	New industrial sources
L	Industrial sources with significantly increased emissions
M	Aircraft

Sections B through M, which were based on 2002 data, have not been updated for the detailed assessment, as they did not reveal any issues during the USA.

Section A - Monitoring data outside an AQMA

1. *Collation of monitoring data*

Nitrogen dioxide is continuously measured at Groeswen Hospital, Margam. The instrument used is a model M200 manufactured by Advanced Pollution Instruments. Data for the calendar years 2003/4 is considered for the purposes of this study.

The authority had seven nitrogen dioxide monitoring tubes for 2003, which were subsequently augmented by an additional 3. These new diffusion tubes were located in the vicinity of the Victoria Gardens site, which was

Detailed assessment of nitrogen dioxide

located on a lamp post near a busy junction. One of the new tubes was placed on a lamp post at the junction and two on the façades of properties on either side of the junction. The sites on the façades were chosen specifically so as to give consideration to maximum public exposure in that area. The three new tubes do not form part of the UK nitrogen dioxide network, which is controlled by AEA Technology, unlike the existing seven tubes.

Ratification of monitoring data

The continuous nitrogen dioxide analyser is part of the Advanced Urban Rural Network (AURN) and is subject to the calibration and quality assurance to the standards of that network. The data used for 2003 was downloaded from the AEA Technology website.

The diffusion tubes are provided by Harwell Scientifics Limited. The tubes are prepared using 20% TEA in Water and are subject to a WASP quality assurance scheme. Harwell have been carrying out a co-location study with a chemiluminescence analyser since the start of 2003. Harwell Scientifics quote a bias correction with each monthly data report. A person at Harwell had previously stated that the data reports include the bias correction factor. However, it has recently come to light that this correction factor is not in fact included in the reported data. This has necessitated a re-calculation of the previously reported figures for this section of the report. Consequently, the data for 2003 and the first six months of 2004 are used for the review. Harwell's bias adjustment factor was typically about 0.75 during 2003, but the value used here is 0.85 as this is the average figure obtained from several co-location studies. The factor was obtained from the spreadsheet at the following location <http://www.uwe.ac.uk/aqm/review/diffusiantube240904.xls>. At the time of writing the spreadsheet was not updated for 2004 data, so the bias adjustment factors used for 2004 were those quoted by Harwell and were typically in the range 0.73 to 0.75.

2. *Calculate annual means from the data and identify highest values*

The annual mean concentration of nitrogen dioxide in 2003 at the Groeswen Hospital continuous monitoring station was 11 µg/m³. The corresponding value for 2004 was 16 µg/m³, although it must be noted that this is based upon partly ratified data.

The annual average concentrations for the diffusion tube sites are shown in the table below:

Table 1. Bias corrected nitrogen dioxide tube data for 2003

Site Id	NO2 µg/m3	Tube Count	Site Type	Site Address
E2/10/10	25.4	12	Urban background	Civic Centre, Neath.
E2/10/12	17.0	12	Urban background	Cwmnedd Primary School, Glynneath.
E2/10/3	39.5	12	Kerbside	Groeswen Hospital, Port Talbot.
E2/10/4	22.7	12	Urban background	21 Rice Street, Port Talbot.
E2/10/6	18.9	12	Urban background	11 College Green, Port Talbot
E2/10/7	34.3	10	Kerbside	11 High Street, Pontardawe.

Detailed assessment of nitrogen dioxide

E2/10/9	44.1	12	Kerbside	6 Victoria Gardens, Neath.
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Table 2. Bias corrected nitrogen dioxide tube data for 2004 (6-8 months)

Site Id	NO2 µg/m3	Tube Count	Site Type	Site Address
E2/10/10	16.9	8	Urban background	Civic Centre, Neath
E2/10/12	12.3	6	Urban background	Cwmnedd Primary School, Glynneath.
E2/10/18	34.6	6	Kerbside	Eastland Road, Neath
E2/10/19	26.6	6	House frontage	8 Victoria Gardens, Neath
E2/10/20	29.5	6	House frontage	28 Eastland Road, Neath
E2/10/3	29.2	8	Kerbside	Margam Road, Margam
E2/10/4	16.3	8	Urban background	21, Rice Street, Port Talbot
E2/10/6	13.7	6	Urban background	11, College Green, Margam
E2/10/7	23.0	8	Kerbside	11 High Street, Pontardawe
E2/10/9	37.4	8	Kerbside	6, Victoria Gardens, Neath

The additional three sites were commissioned following the 2003 review and assessment and are designed to investigate the air quality issues in the vicinity of Victoria Gardens. Six months worth of data has now been collected at these locations.

The bias corrected values were obtained by multiplying the reported values by the bias correction factor.

3. Estimate the annual mean concentrations in 2005.

The concentrations of the kerbside sites for 2005 is calculated using the following equation:

$\text{Conc}(2005) = \text{Conc}(2004) * 0.892 / \text{Correction factor for year of measurement.}$

The correction factors for 2003 and 2004 are 0.941 and 0.915 respectively.

The calculated values for the highest sites are shown below:

Table 3. Estimate of 2005 annual means from 2003 data.

Site Id	NO2 µg/m3
E2/10/10	24.2
E2/10/12	16.1
E2/10/3	37.4
E2/10/4	21.5
E2/10/6	17.9
E2/10/7	32.5
E2/10/9	41.8

Table 4. Estimate of 2005 annual means from 2004 data (six months).

Site Id	NO2 µg/m3
E2/10/10	16.5
E2/10/12	12.0
E2/10/18	33.7
E2/10/19	25.9

Detailed assessment of nitrogen dioxide

E2/10/20	28.8
E2/10/3	28.5
E2/10/4	15.9
E2/10/6	13.4
E2/10/7	22.4
E2/10/9	36.5

4. *Calculate the number of 1-hour exceedences of 200 µg/m³ in a full year, or the 99.8th percentile of hourly means.*

The maximum 1-hour average during 2003 at the Groeswen Hospital site was 58 µg/m³, well below the 200 µg/m³ limit. The corresponding figure for the first eight months of 2004 was 92 µg/m³ (partly ratified data).

5. *Calculate exceedences.*

Items 3 and 4 above show that there could be an exceedence of the 40 µg/m³ limit at Victoria Gardens (41.8 µg/m³) based upon the full year's worth of 2003 data. However it should be noted that the site is located on a lamp post and not on the frontage of a residential property. The corresponding data for 2004, based on 8 months worth of data does not show that an exceedance will occur. It should also be noted that the new monitoring locations, two of which are based at the frontages of residential properties, show lower levels. Monitoring will continue at the new sites for some time as it is important that more data is collected to gain confidence in these results, which must currently be regarded as interim.

Item 4 above shows that there are currently no exceedences of the 200 µg/m³ limit and there are not likely to be any at the continuous monitoring site. In particular, concentrations at residential properties near Victoria Gardens where public exposure is likely to be at a maximum, are significantly lower than those at the pre-existing lamp post site.

Conclusion

The detailed assessment shows that it is predicted that the Air Quality Objective for nitrogen dioxide will not be exceeded and therefore there is no need to declare an Air Quality Management Area for nitrogen dioxide.

Introduction

The Government and Devolved Administrations have adopted two Air Quality Objectives for PM₁₀. An annual mean concentration of 40 µg/m³ and 50 µg/m³ as a fixed 24-hour mean not to be exceeded more than 35 times per year. Both objectives are to be achieved by the end of 2004. The objectives are based upon measurement carried out using the European gravimetric transfer reference sampler method.

Detailed assessment

The checklist approach suggested by Defra for the Updating and Screening Assessment has been used again for the Detailed Assessment. It consists of the following main parts:

Box 2: Summary of the Updating and Screening checklist for PM₁₀	
Reference No.	Source, location or data that need to be assessed
A	Monitoring data outside an AQMA
B	Monitoring data within an AQMA
C	Busy roads and junctions in Scotland
D	Junctions
E	Roads with high flow of buses and/or HGVs
F	New roads constructed or proposed since first round of review and assessment
G	Roads close to the objective during the first round of review and assessment
H	Roads with significantly changed traffic flows
I	New industrial sources
J	Industrial sources with significantly increased emissions
K	Areas with domestic solid fuel burning
L	Quarries, landfill sites, opencast coal, handling of dusty cargoes at ports etc
M	Aircraft

Only Section B has been repeated as the Updating and Screening Assessment highlighted the new blast furnace and emissions from the works as an issue. The Detailed Assessment therefore consists of consideration of ongoing continuous monitoring data from within the AQMA:

Section B - Monitoring within an AQMA

1. *Collation of monitoring data*

PM₁₀ is continuously measured at Groeswen Hospital, Margam. The instrument used is Tapered Element Oscillating Microbalance (TEOM), manufactured by Rupprecht and Pattschnick. Data for the calendar year 2003 and the first six months of 2004 is considered for the purposes of the Detailed Assessment.

2. *Ratification of monitoring data*

The continuous PM₁₀ analyser is part of the Advanced Urban Rural Network (AURN) and is subject to the calibration and quality assurance to

the standards of that network. The data used for 2003/4 was downloaded from the website of the Welsh Air Quality Forum.

3. *Calculate annual means and the number of 24-hour exceedences*

The annual mean gravimetric concentration of PM₁₀ in 2003 at the Groeswen Hospital continuous monitoring station was 31.7 µg/m³. The corresponding figure for the first six months of 2004 was 33.9 µg/m³

4. *Calculate the number of 24-hour exceedences of 50 µg/m³ in 2004.*

In 2003 there were 43 gravimetric exceedences of the 24-hour 50 µg/m³ limit. The corresponding figure for the first six months of 2004 was 28 exceedences.

Conclusion

The detailed assessment shows that there are still sufficient exceedences of the of the 24-hour 50 µg/m³ limit to warrant continuation of the Air Quality Management Area.

Considering the above data and assuming continued operation of the Corus Steel Works it is not considered that the Provisional Objectives of not greater than 7 exceedences for the 24 hour mean Objective of 50 µg/m³ and annual average of 20 µg/m³ for 2010 will be met.