

Part IV Environment Act 1995

Review and Assessment of Air Quality

**Detailed Assessment of nitrogen dioxide
(June 2011)**

Air Quality
DETAILED ASSESSMENT (June 2010)

CONTENTS

SUMMARY	3
INTRODUCTION.....	4
MONITORING SITE	4
COLLECTION, VALIDATION AND RATIFICATION OF DATA	11
RESULTS.....	11
CONCLUSION	13

SUMMARY

This document has been produced in response to the requirements of the Welsh Government for 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 or Progress Report of all seven pollutants designated for the purposes of local air quality management, which has been previously completed. The second stage is a detailed assessment of individual pollutants if the first stage indicates that it is needed.

The previously 2010 Air Quality Progress Report identified that a detailed assessment was required for nitrogen dioxide (NO₂) at Pontardawe Post Office and at Victoria Gardens, Neath. In addition, previous studies had raised questions about NO₂ levels at Water Street, Port Talbot although more recent data had begun to indicate that this might be less of a problem.

The detailed assessment shows that Air Quality Objectives are complied with at Water Street, but not at the other two locations. As diffusion tubes were used to assess compliance at these two non-compliant sites, continuous analysers will be deployed to provide data on whether a declaration of AQMAs needs to be made.

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 $40 \mu\text{g}/\text{m}^3$ and a 1-hour mean concentration of $200 \mu\text{g}/\text{m}^3$ 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 $200 \mu\text{g}/\text{m}^3$ applies, not to be exceeded by more than 18 times per year. An annual mean limit value of $40 \mu\text{g}/\text{m}^3$ also applies, both to be achieved by the 1st January 2010.

Monitoring sites

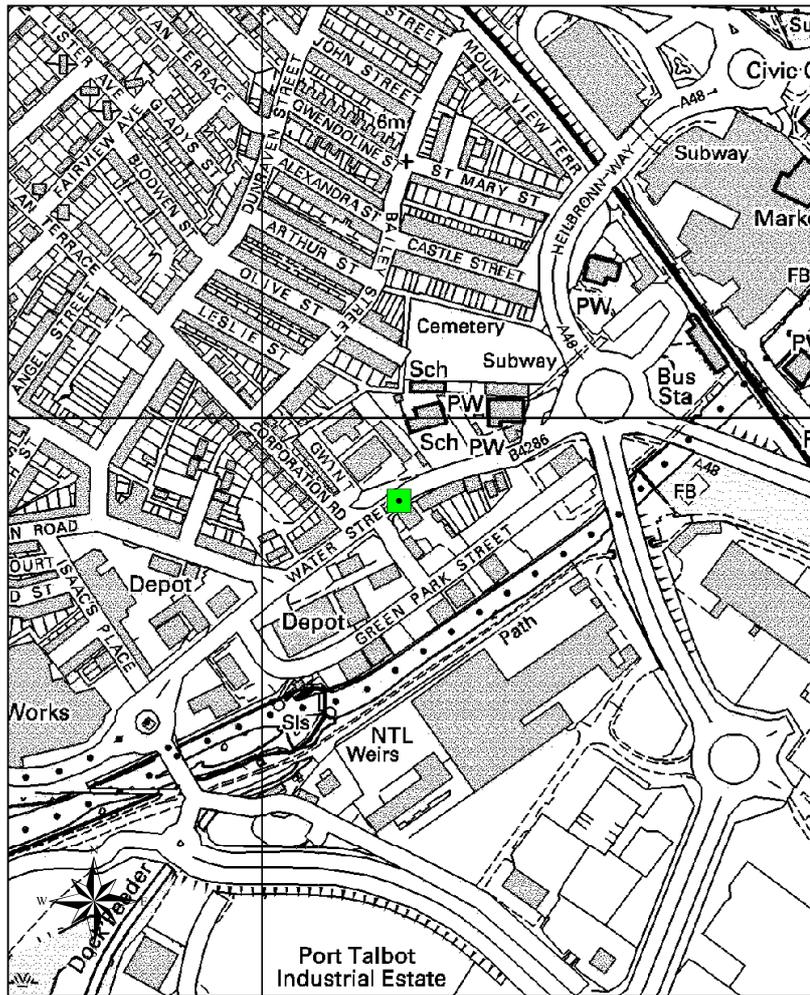
Nitrogen dioxide is measured at Water Street, Port Talbot using a model M200 continuous analyser manufactured by Advanced Pollution Instruments. The analyser is located inside the Old Fire Station with sampling via an inlet on the frontage at a height of approximately 2.7 metres. The Old Fire Station is situated at the end of a terrace of residential properties. Water Street has the highest daily averaged traffic flow in the County Borough for a residential street, with approximately 20,000 to 22,000 vehicles per day. The sampling point is also near to a bus stop.

The 2010 Air Quality Progress Report identified possible exceedances of the annual averaged Air Quality Objective at 1 Victoria Gardens in Neath and at Pontardawe Post Office. As a consequence, diffusion tubes were deployed in triplicate at Pontardawe Post Office from August 2011. Diffusion tubes were deployed from September 2009 at 8, 10 and 11a Swansea Road, Pontardawe on the same street as the Post Office.

The monitoring site at 1 Victoria Gardens, Neath had to be discontinued in March 2010 for reasons of health and safety. The kerb is very narrow and low at this point and staff felt that there was a danger of being knocked off the ladder by the busy traffic. Consequently, the monitoring site at 3 Victoria Gardens (next door) was deployed in triplicate from August 2010. The NO_2 concentration with distance calculator would be used to estimate the concentration at 1 Victoria Gardens.

Detailed assessment of nitrogen dioxide

Figure 1. Location of NO₂ continuous analyser at Old Fire Station, Water Street, Port Talbot



0.00 0.25 0.05 Miles
+++++

Detailed assessment of nitrogen dioxide

Figure 2. Water Street with Old Fire Station and Bus Stop in foreground

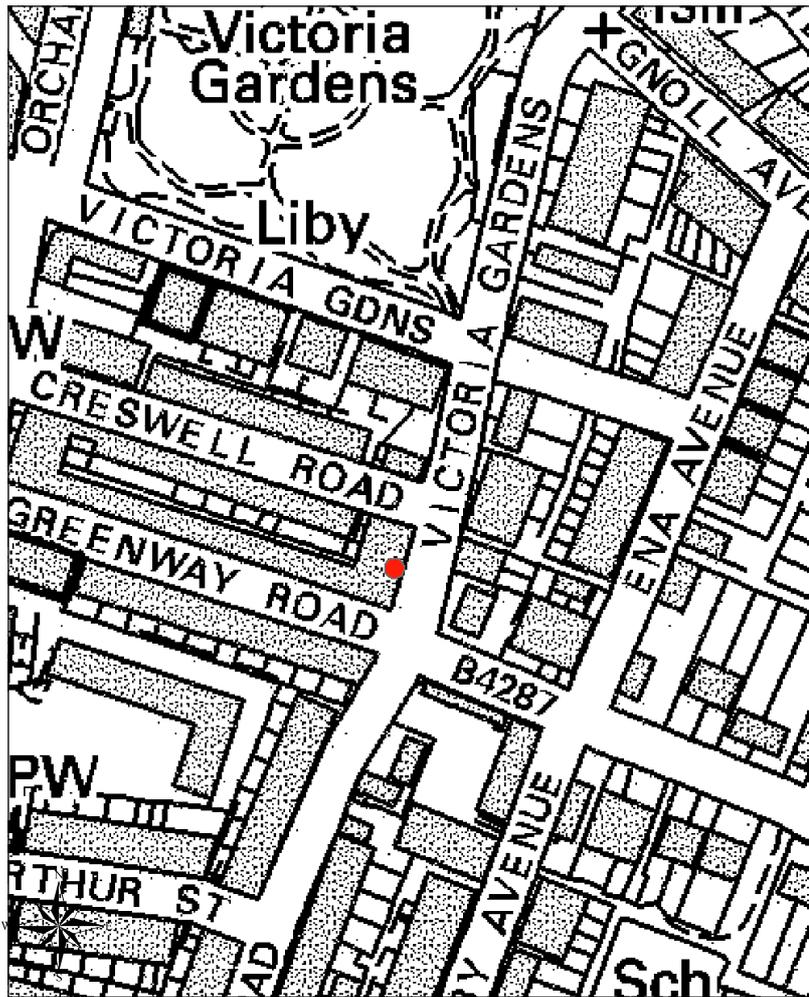


Figure 3. Sampling inlet at Old Fire Station, Water Street



Sampling inlet at approx
2.75 metres height to
avoid vandalism

Figure 4. Location of NO₂ diffusion tubes at 3 Victoria Gardens, Neath



000300.014 Miles
+++++

Detailed assessment of nitrogen dioxide

Figure 5. Victoria Gardens monitoring sites

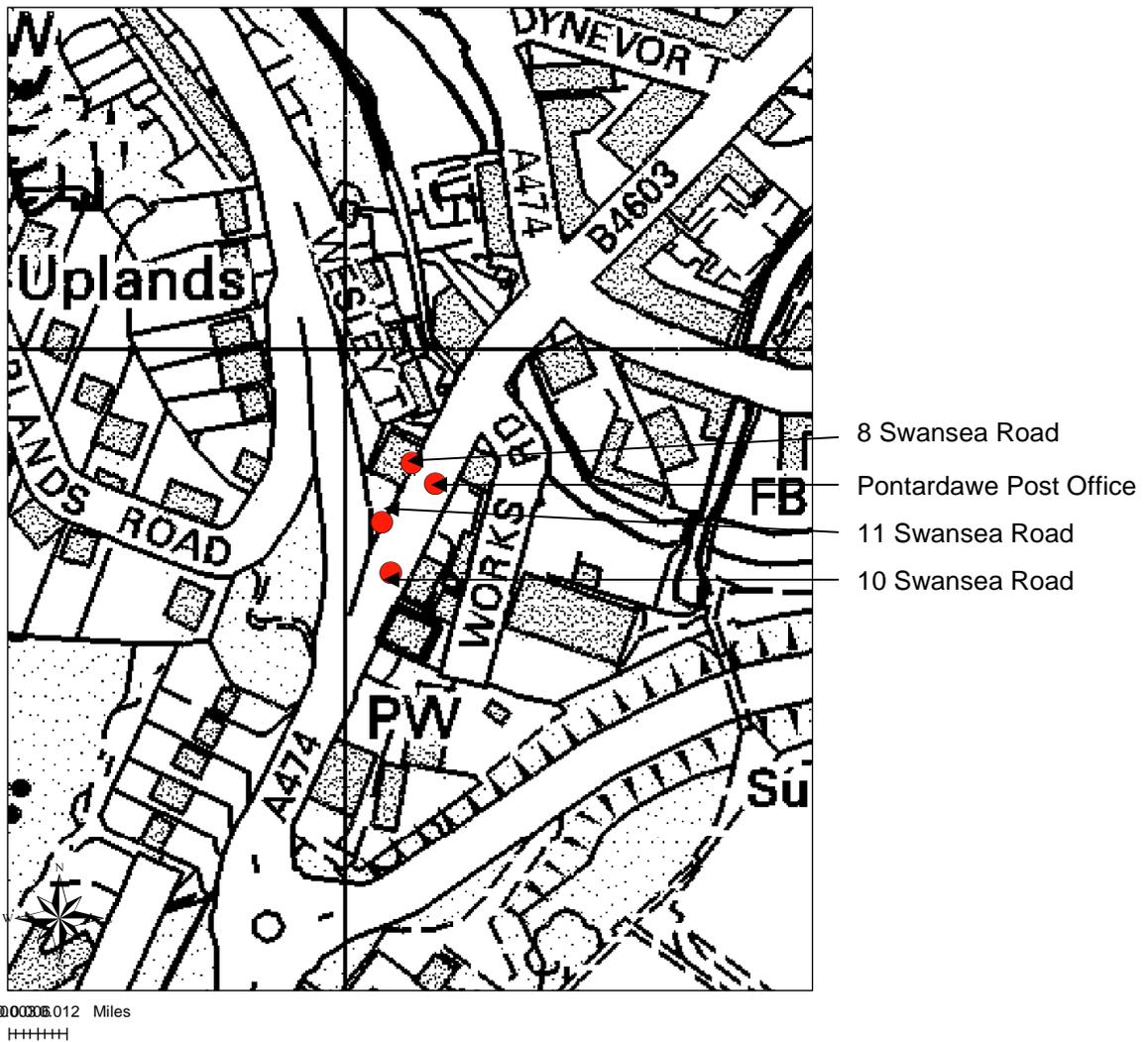


3 Victoria Gdns

1 Victoria Gdns

Detailed assessment of nitrogen dioxide

Figure 6. Location of NO₂ diffusion tubes at Swansea Road, Pontardawe



Detailed assessment of nitrogen dioxide

Figure 7. Location of monitoring sites at Swansea Road, Pontardawe



Pontardawe Post Office



8 Swansea Road



10 Swansea Road

Detailed assessment of nitrogen dioxide

Collection, validation and ratification of data

Data from the Water Street sampler is polled on an hourly basis using “Monnet” software developed by King’s College London to run the London Air Quality Network. The software applies automatic validation flags to the data depending on the status of the instrument. Data is also automatically scaled according to the latest calibration values.

The sampler is MCERTS certified and is calibrated on an approximately fortnightly basis using a nitrogen monoxide calibration cylinder recertified to national standards by AEA Technology (certificate number 01989). The instrument is periodically audited by AEA Technology, most recently on 15th September 2009 and 11 May 2010. Final ratification of the data is carried out by King’s College London.

Diffusion tubes are exposed for one month and are provided and analysed by Harwell Scientifics. The tubes are prepared using acetone:triethanolamine (50:50) and are subject to intercomparison quality assurance tests as part of the Workplace Analysis Scheme for Proficiency (WASP).

Results

Data are reported for the calendar year of 2010.

The average concentration of NO₂ at Water Street was 13.9 µg/m³ and the data capture rate was 98.5% for the calendar year. The maximum hourly average concentration of NO₂ was 82.9 µg/m³. Consequently, there were no breaches of either the annual averaged AQO (40 µg/m³) or the hourly averaged AQO (200 µg/m³).

Table 1a Results of Automatic Monitoring at Water Street for Nitrogen Dioxide: Comparison with Annual Mean Objective

Site ID	Location	Within AQMA?	Proportion of year with valid data 2009 %	Annual mean concentrations (µg/m ³)
				2010
WS2	Water Street	N	98	26.5

Detailed assessment of nitrogen dioxide

Table 1b Results of Automatic Monitoring at Water Street for Nitrogen Dioxide: Comparison with 1-hour Mean Objective

Site ID	Location	Within AQMA?	Proportion of year with valid data 2009 %	Number of Exceedences of hourly mean (200 µg/m ³) <i>If the period of valid data is less than 90% of a full year, include the 99.8th %ile of hourly means in brackets.</i>
				2010
WS2	Water Street	N	98	0

Figure 4. Nitrogen dioxide hourly average concentrations at Water Street for 2010

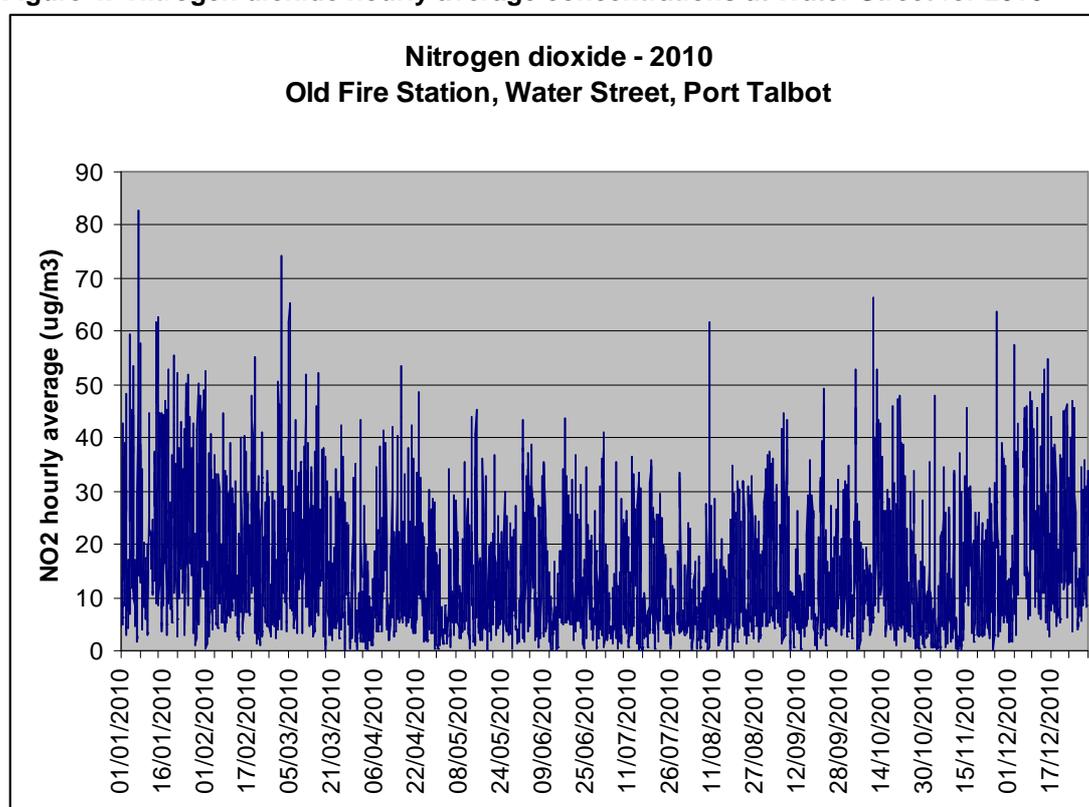


Table 2 Results for NO₂ diffusion tube sites

Site	Data Capture	Raw data average (µg)	Bias Adjusted Average (µg)	Corrected annual average (µg)
3 Victoria Gdns Neath	100%	49.3	41.9	41.9*
Post Office, Swansea Road, Pontardawe	100%	53.1	45.1	45.1*
8 Swansea Road, Pontardawe	16%	40.5	34.4	+
10 Swansea Road, Pontardawe	33%	46.0	39.1	32.8
11a Swansea Road, Pontardawe	33%	54.7	46.5	39.0

* - Correction was not necessary since data capture was 100%

+ - Data capture rate too low to quote results.

Detailed assessment of nitrogen dioxide

A bias adjustment factor of 0.85 was applied to raw data, which was derived from the NO₂ diffusion tube bias adjustment factor spreadsheet, obtained from the Review & Assessment Helpdesk website.

Where there was less than 100% data capture, corrected annual averages were calculated using the methodology defined in Box 3.2 on page 3-4 of TG(09). The following sites were used for the calculations, all of which had data capture rates in excess of 90%. This approach can only be used where the data capture is 25% or more. Data capture at 8 Swansea Road was lower due to theft of the diffusion tubes.

Table 11. Sites used for estimating annual mean

Site Id	Site	Local authority	Network / Monitoring type	Site Type
A	Fonmon	Vale of Glamorgan	WAQF Chemiluminescence	Rural
B	Narberth	Pembrokeshire	AURN Chemiluminescence	Rural
C	Cwmbran	Torfaen	WAQF Chemiluminescence	Urban background
D	Malpas	Newport	WAQF Chemiluminescence	Urban background

Site Id	Annual Mean 2009 (Am)	Period Mean 2010 – (Pm)	Ratio (Am/Pm)
A	12.2	15.0	0.813
B	4.8	5.5	0.873
C	16.0	20.8	0.769
D	21.9	24.4	0.898
Average (Ra)			0.838

The NO₂ distance from roads calculator was used to estimate the annual average NO₂ concentration at 1 Victoria Gardens, Neath. The following data was used as input:

- Distance of measurement from the kerb (i.e. 3 Victoria Gardens) = 2.9 metres.
- Distance from kerb to receptor = 0.95 metres.
- Local annual background NO₂ concentration = 18.35 µg/m³.
- Measured annual mean NO₂ concentration (3 Victoria Gardens) = 41.9 µg/m³.

The predicted annual mean NO₂ concentration at 1 Victoria Gardens was 48.6 µg/m³.

Conclusion

The detailed assessment shows that the neither the annual averaged Air Quality Objective (40 µg/m³) nor the hourly averaged AQO (200µg/m³) for nitrogen dioxide were exceeded at Water Street. The margin of compliance is sufficiently wide to allow deployment of the continuous monitoring equipment to a higher priority site.

Detailed assessment of nitrogen dioxide

Measurements of NO₂ at Victoria Gardens, Neath using diffusion tubes show that the annual mean AQO (40 µg/m³) is being slightly breached at 3 Victoria Gardens. However, the margin of non-compliance is likely to be more significant at 1 Victoria Gardens and amounts to approximately 8.6 µg/m³.

Measurements of NO₂ at Swansea Road, Pontardawe showed that the mean concentration at the Post Office (45.1 µg/m³) exceeded the AQO. Results at two other sites nearby did not exceed the AQO, but this was an estimation based on relatively low data capture. There was not enough data at another site to allow estimation of compliance.

Paragraph A1.42 of LAQM.TG(09) states that local authorities are advised not to rely upon diffusion tube data alone as the basis for declaration of an AQMA. Diffusion tubes were deployed in triplicate at Pontardawe Post Office and 3 Victoria Gardens from August 2011, so the majority of the year's data at both sites is based upon single diffusion tubes.

The Council has therefore purchased a continuous monitoring station to accurately measure NO₂ levels at Pontardawe Post Office. This unit will be deployed once received from the supplier. The Council also intends to re-deploy the continuous NO₂ monitor from Water Street to Victoria Gardens. The aim shall be to collect sufficient reliable data to allow a decision on declaration of AQMAs at both locations.