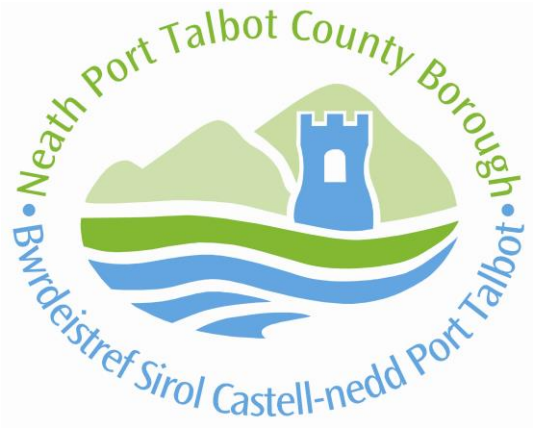


Part IV Environment Act 1995

Detailed Assessment of nitrogen dioxide – (July 2016)

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

Date (July 2016)

Local Authority Officer	Martin Hooper
Department	Environment
Address	Quays Brunel Way Baglan Energy Park Neath SA11 2GG
Telephone	01639 686517
e-mail	m.hooper@npt.gov.uk
Report Reference number	E2/16/9/2016 DA
Date	July 2016

Air Quality

DETAILED ASSESSMENT OF NITROGEN DIOXIDE – (xx 2016)

CONTENTS

SUMMARY

This document has been produced in response to the requirements of the Welsh Government for review and assessment of air quality. The 2014 Detailed Assessment of air quality concluded that a Detailed Assessment was necessary at Victoria Gardens, Neath.

Measurements have shown that the only location having relevant exposure where the annual averaged AQO was breached was No. 1 Victoria Gardens (40.7 ug/m^3). However, this exceedance is marginal and is based upon the use of the NO_2 with distance calculator spreadsheet. This will have introduced an additional degree of uncertainty over and above that introduced by the use of diffusion tubes (albeit in triplicate) at No. 3 Victoria Gardens.

The aim of the Detailed Assessment is to establish with reasonable certainty whether there is a likelihood that AQOs are not being achieved. It is considered that this result is not sufficient in this regard and that an AQMA will not be declared at this time.

The Council therefore intends to deploy diffusion tubes in triplicate at No. 1 Victoria Gardens using circular clips which will allow deployment without the need for ladders. This will overcome the previous health and safety limitation on monitoring at this location and will eliminate the additional uncertainty introduced by the NO_2 with distance calculator spreadsheet. A further Detailed Assessment of NO_2 shall then be carried out on 2016 data.

Introduction

The Government and Devolved Administrations have adopted two Air Quality Objectives for nitrogen dioxide. An annual mean concentration of 40 µg/m^3 and a 1-hour mean concentration of 200 µg/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 µg/m^3 applies, not to be exceeded by more than 18 times per year. An annual mean limit value of 40 µg/m^3 also applies, both to be achieved by the 1st January 2010.

Summary of recent investigations and developments

The 2010 Air Quality Progress Report identified that a detailed assessment was required for nitrogen dioxide (NO_2) at Pontardawe Post Office and at Victoria Gardens, Neath.

The 2011 detailed assessment was carried out using more diffusion tubes and this confirmed a potential problem at both locations. As a consequence of these findings it was decided that continuous analysers would be deployed to provide more reliable data for a decision on whether a declaration of AQMAs needed to be made. Both analysers were deployed in July 2012.

It was not possible to site the continuous analyser at the frontage of the Post Office due to a lack of space and health & safety considerations. The nearest location where this could be located was the nearby old bus stop, which is less than 5 metres from the diffusion tube on the frontage of the Post Office. It became clear that results at the continuous monitor were significantly lower than those at the frontage of the Post Office. Consequently, diffusion tubes were deployed in triplicate on the monitor.

It was impossible to locate the analyser at the frontage of 1, Victoria Gardens, given the very narrow pavement. An attempt was therefore made to set up the instrument in the front garden of No. 3 next door. However the owner of the property withdrew permission for use of the garden shortly after the equipment was deployed, so another site had to be found. The location on the pavement near the lights had sufficient room and had no safety issues.

In order to try to avoid the need for declaration of an AQMA at Pontardawe, steps were taken to try to reduce pollution levels at the Post Office. The bus stop was relocated approximately 55 metres further up the hill beyond the houses at 10 & 12 Swansea Road. Pollution from buses can be considerable and there were also reports of buses idling so relocation of the bus stop was aimed at reducing pollution levels at the Post Office.

At the same time, double yellow lines were extended outside the Post Office. The aim was to discourage parking outside, which tends to cause tailbacks and congestion as the road is not wide enough for vehicles to pass parked cars if there is queuing a the lights.

An extra two parking spaces were provided off road at the new bus stop with the further goal of reducing congestion. All of these works were completed in March 2013.

In addition, the sequencing of the traffic lights was reviewed in October 2011 in order to try to reduce queuing up Swansea Road past the Post Office.

The Council has not used modelling to determine pollution levels as it is less accurate than monitoring. Instead diffusion tubes have been deployed at relevant locations and a local bias adjustment factor has been employed based upon three continuous analysers co-located with diffusion tubes.

The interim 2012 detailed assessment showed that neither the annual averaged Air Quality Objective (40 µg/m^3) nor the hourly averaged AQO (200µg/m^3) for nitrogen dioxide were exceeded at sites near Pontardawe Post Office.

Continuous measurements of NO_2 at Victoria Gardens, Neath showed that the hourly averaged AQO was complied with. The annual averaged AQO was also complied with at all sites where diffusion tubes were deployed. However, a single property at 1 Victoria Gardens (41.7 µg/m^3) was predicted to exceed the annual averaged AQO when NO_2 levels were calculated with the "distance from roads spreadsheet". This exceedance was considered to be quite marginal and was based upon less than a year's worth of data. It was therefore considered that bias adjustment factors would have been less reliable than would have been the case for a full year of data. Consequently an AQMA was not declared at that stage. Rather, a detailed assessment would be repeated with a full year's worth of data.

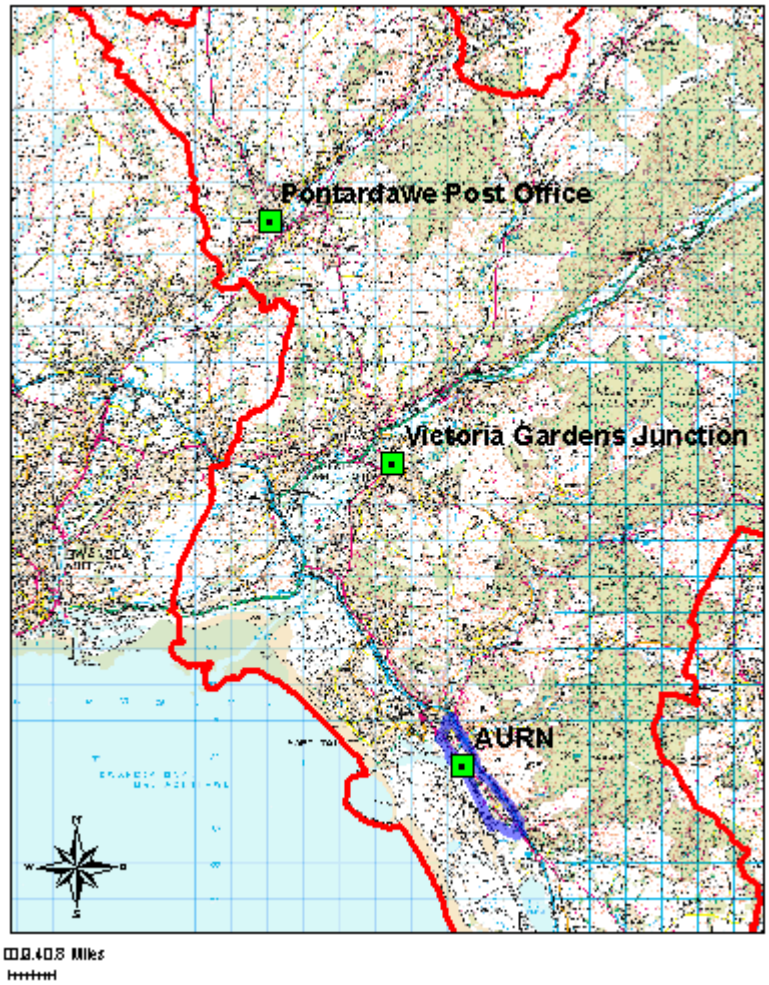
A detailed assessment for the calendar year of 2014 showed that neither the annual averaged Air Quality Objective (40 µg/m^3) nor the hourly averaged AQO (200µg/m^3) for nitrogen dioxide were exceeded at sites near Victoria Gardens, Neath. Although, a single property at 1 Victoria Gardens (39.8 µg/m^3) was close to, but did not exceed the annual averaged AQO when NO_2 levels when calculated with the "distance from roads spreadsheet".

Monitoring sites

Automatic monitoring sites

Nitrogen dioxide is continuously measured at Pontardawe Post Office, at Victoria Gardens in Neath and at Margam Fire Station (AURN).

Figure 1. Nitrogen dioxide monitoring locations



However, this detailed assessment deals only with data from Neath as NO_2 levels at the other locations have not necessitated a detailed assessment.

Table 1. NO_2 monitoring station details

Site ID	**Site Name**	**Site Type**	**X OS Grid Reference**	**Y OS Grid Reference**	**Inlet Height (m)**	**Pollutants Monitored**	**In AQMA?**	**Monitoring Technique**	**Relevant Exposure?** (Y/N with distance (m) from monitoring site to relevant exposure)	**Distance to Kerb of Nearest Road (m)** (N/A if not applicable)	**Does this Location Represent Worst-Case Exposure?**
VG2	Victoria Gardens	Roadside	275471	197183	1.4	NO_2	N	Chemiluminescence	Y (21)	1	N

Figure 2 - NOx analyser on Cimla Road

Figure 3 – View across junction to Victoria Gardens

Diffusion tube monitoring sites

Nitrogen dioxide is measured at a variety of locations using passive diffusion tubes. The tubes are exposed for one month and are provided and analysed by ESG at Didcot. 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).

This report deals only the sites in the vicinity of Victoria Gardens, Neath.

Figure 4 Location of NO_2 diffusion tubes in Neath

Table 2. Details of Non- Automatic Monitoring Sites

Site ID	Site Name	Site Type	X OS Grid Reference	Y OS Grid Reference	Site Height (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) (N/A if not applicable)	Does this Location Represent Worst-Case Exposure?
4	8 Victoria Gardens, Neath	Roadside	275494	197272	1.5	NO_2	N	N	Y (2m)	4.5 m	N
5	28 Eastland Road, Neath	Roadside	275420	197161	1.5	NO_2	N	N	Y (0m)	4 m	N
12	34 Eastland Road, Neath	Roadside	275427	197139	1.5	NO_2	N	N	Y (0m)	4 m	N
13	40 Eastland Road, Neath	Roadside	275415	197110	1.5	NO_2	N	N	Y (0m)	4 m	N

Site ID	Site Name	Site Type	X OS Grid Reference	Y OS Grid Reference	Site Height (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) (N/A if not applicable)	Does this Location Represent Worst-Case Exposure?
14	32 Eastland Road, Neath	Roadside	275431	197149	1.5	NO_2	N	N	Y (0m)	4 m	N
15	30 Eastland Road, Neath	Roadside	275434	197157	1.5	NO_2	N	N	Y (0m)	4 m	N
16	5 Victoria Gardens, Neath	Roadside	275464	197230	1.5	NO_2	N	N	Y (0m)	3.5 m	Y
17	1 Greenway Road, Neath	Roadside	275455	197211	2.0	NO_2	N	N	Y (0m)	1 m	Y

Site ID	Site Name	Site Type	X OS Grid Reference	Y OS Grid Reference	Site Height (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) (N/A if not applicable)	Does this Location Represent Worst-Case Exposure?
20	3 Victoria Gardens, Neath	Roadside	275463	197223	1.5	NO_2	N	N	Y (0m)	3.5 m	Y
21	50 Greenway Road, Neath	Roadside	275452	197195	2.0	NO_2	N	N	Y (0m)	1 m	Y
23	4 Victoria Gardens, Neath	Roadside	275482	197227	1.5	NO_2	N	N	Y (0m)	3.5 m	Y
34	Lights at Cimla Junction	Roadside	275472	197185	1.4	NO_2	N	Y	Y (20m)	1.5 m	N

Comparison of Monitoring Results with Air Quality Objectives

Table 3 Results of Automatic Monitoring for NO_2: Comparison with Annual Mean Objective

Site ID	Site Type	Within AQMA?	Valid Data Capture for Monitoring Period % [a]	Valid Data Capture 2015 % [b]	Annual Mean Concentration (µg/m^3)				
					2011* [c]	2012* [c]	2013* [c]	2014* [c]	2015 [c]
VG2	Roadside	N	99	99	-	**51**	**42**	**42**	40

In bold, exceedence of the NO_2 annual mean AQS objective of 40µg/m^3

[a] i.e. data capture for the monitoring period, in cases where monitoring was only carried out for part of the year

[b] i.e. data capture for the full calendar year (e.g. if monitoring was carried out for six months the maximum data capture for the full calendar year would be 50%)

[c] Means should be "annualised" as in Boxes 7.9 and 7.10 of LAQM.TG16, if valid data capture is less than 75%

* Annual mean concentrations for previous years are optional

Figure 5 – Trends in Annual Mean NO_2 Concentrations Measured at Victoria Gardens Monitoring Site

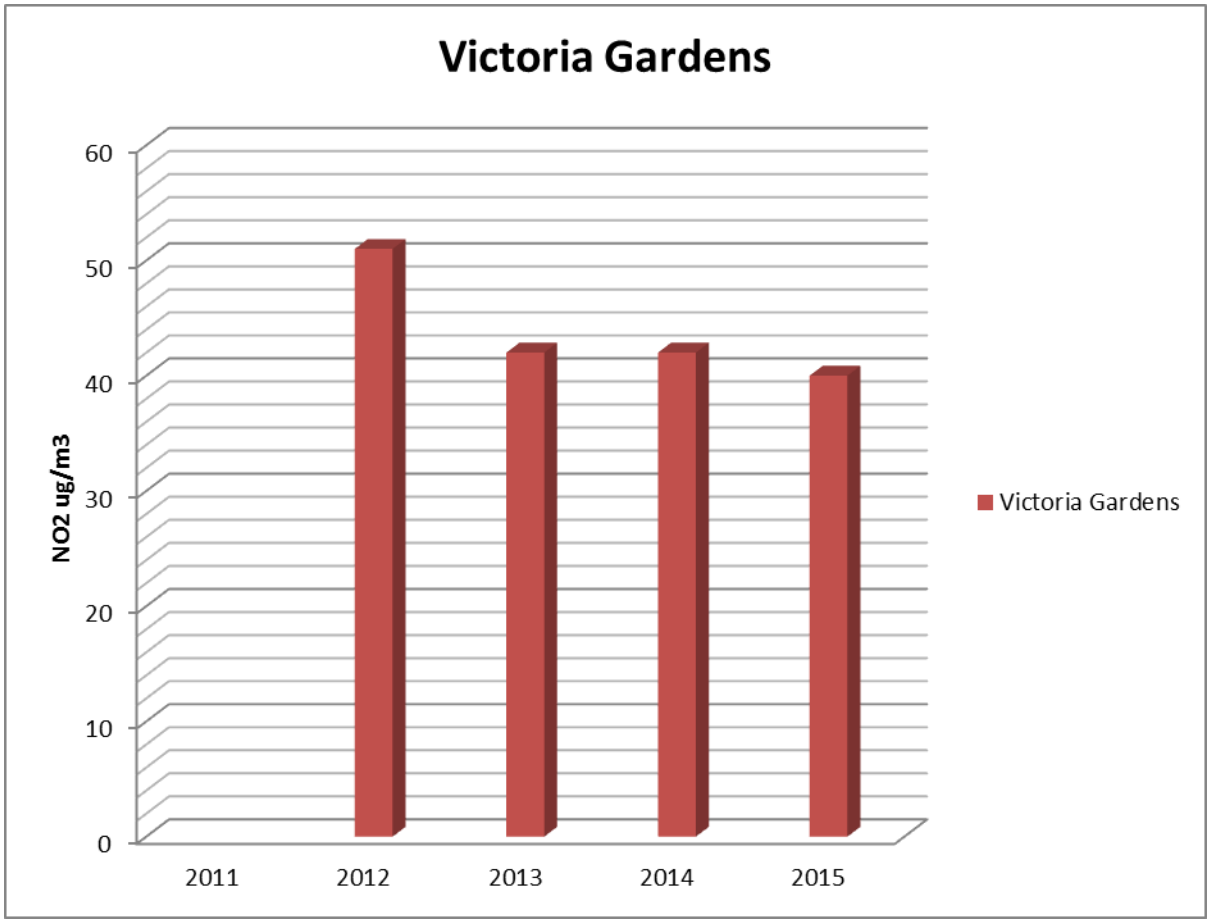


Table 4 Results of Automatic Monitoring for NO_2: Comparison with 1-hour Mean Objective

Site ID	Site Type	Within AQMA?	Valid Data Capture for Monitoring Period % [a]	Valid Data Capture 2015 % [b]	Number of Hourly Means > 200µg/m^3				
					2011* [c]	2012* [c]	2013* [c]	2014* [c]	2015 [c]
VG2	Roadside	N	99	99	-	0 (142)	0	0	0

In bold, exceedence of the NO_2 hourly mean AQS objective (200µg/m^3 – not to be exceeded more than 18 times per year)

[a] i.e. data capture for the monitoring period, in cases where monitoring was only carried out for part of the year

[b] i.e. data capture for the full calendar year (e.g. if monitoring was carried out for six months the maximum data capture for the full calendar year would be 50%)

[c] If the data capture for full calendar year is less than 90%, include the 99.8th percentile of hourly means in brackets

* Number of exceedences for previous years is optional

Table 5 Results of NO_2 Diffusion Tubes 2013

Site ID	Location	Site Type	Within AQMA?	Triplicate or Co-located Tube	Full Calendar Year Data Capture 2015 (Number of Months or %) [a]	2015 Annual Mean Concentration (µg/m^3) - Bias Adjustment factor = 0.80 [b]
4	8 Victoria Gardens, Neath	Roadside	N	N	12	25.7
5	28 Eastland Road, Neath	Roadside	N	N	12	29.6
12	34 Eastland Road, Neath	Roadside	N	N	12	28.9
13	40 Eastland Road, Neath	Roadside	N	N	12	26.2
14	32 Eastland Road, Neath	Roadside	N	N	12	30.1

Site ID	Location	Site Type	Within AQMA?	Triplicate or Co-located Tube	Full Calendar Year Data Capture 2015 (Number of Months or %) [a]	2015 Annual Mean Concentration (µg/m^3) - Bias Adjustment factor = 0.80 [b]
15	30 Eastland Road, Neath	Roadside	N	N	12	29.8
16	5 Victoria Gardens, Neath	Roadside	N	N	12	32.8
17	1 Greenway Road, Neath	Roadside	N	N	12	33.9
20	3 Victoria Gardens, Neath	Roadside	N	Triplicate	12	34.1
21	50 Greenway Road, Neath	Roadside	N	N	12	39.5

Site ID	Location	Site Type	Within AQMA?	Triplicate or Co-located Tube	Full Calendar Year Data Capture 2015 (Number of Months or %) [a]	2015 Annual Mean Concentration (µg/m^3) - Bias Adjustment factor = 0.80 [b]
23	4 Victoria Gardens, Neath	Roadside	N	N	12	27.4
34	Lights at Cimla Junction	Roadside	N	Triplicate and Co-located	12	**46.6**

In bold, exceedence of the NO_2 annual mean AQS objective of 40µg/m^3

Underlined, annual mean > 60µg/m^3, indicating a potential exceedence of the NO_2 hourly mean AQS objective

[a] Means should be "annualised" as in Boxes 7.9 and 7.10 of LAQM.TG16, if full calendar year data capture is less than 75%

[b] If an exceedence is measured at a monitoring site not representative of public exposure, NO_2 concentration at the nearest relevant exposure should be estimated based on the "NO_2 fall-off with distance" calculator (http://laqm.defra.gov.uk/tools-monitoring-data/no2-falloff.html), and results should be discussed in a specific section. The procedure is also explained in paragraphs 7.77 to 7.79 of LAQM.TG16.

Table 6 Results of NO_2 Diffusion Tubes (2008 to 2012)

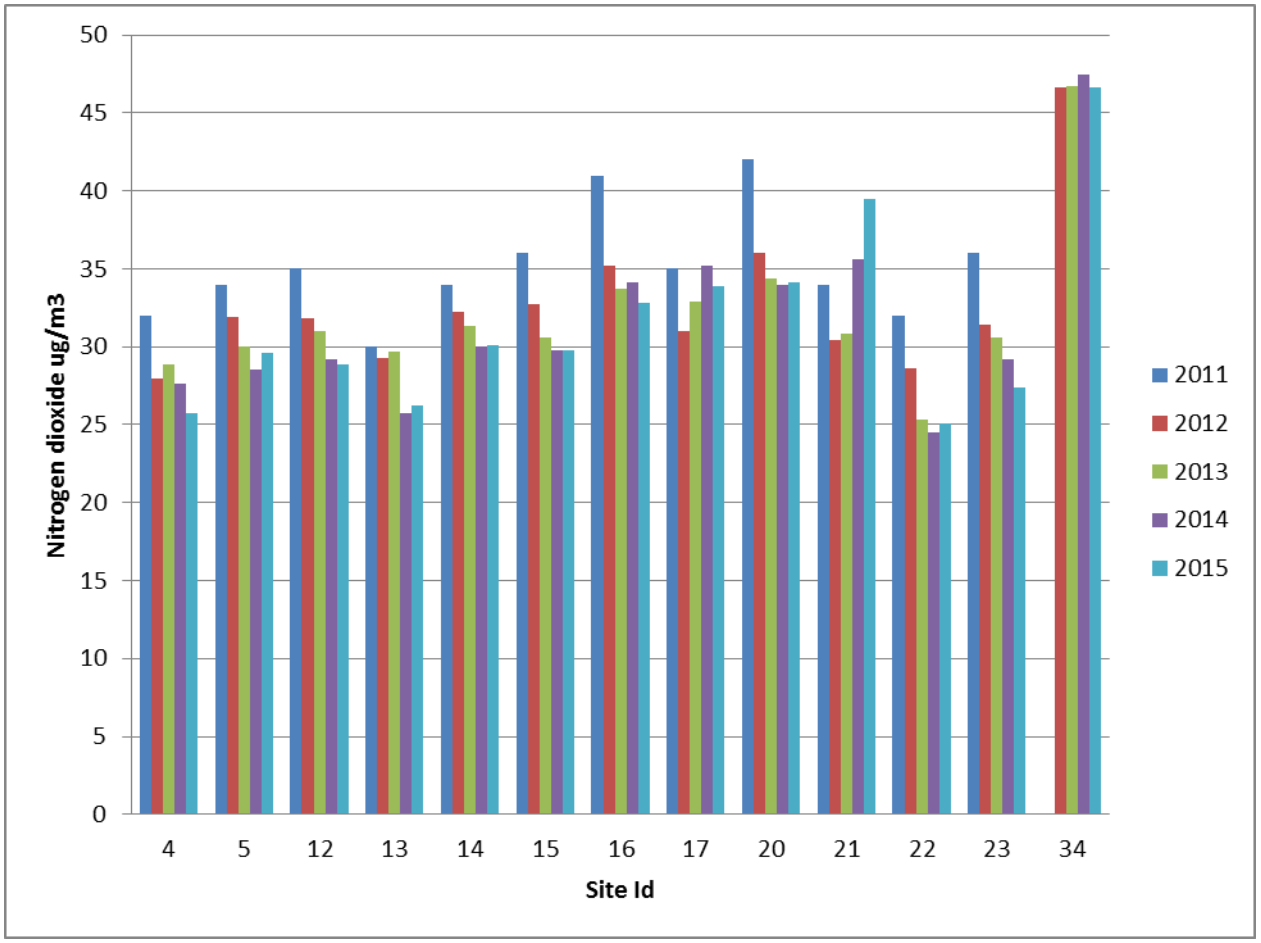
Site ID	Site Type	Within AQMA?	Annual Mean Concentration (µg/m^3) - Adjusted for Bias [a]				
			2011 (Bias Adjustment Factor = 0.83)	2012 (Bias Adjustment Factor = 0.79)	2013 (Bias Adjustment Factor = 0.75)	2014 (Bias Adjustment Factor = 0.78)	2015 (Bias Adjustment Factor = 0.80)
4	Roadside	N	32	28.0	28.9	27.6	25.7
5	Roadside	N	34	31.9	30.0	28.5	29.6
12	Roadside	N	35	31.8	31.0	29.2	28.9
13	Roadside	N	30	29.3	29.7	25.7	26.2
14	Roadside	N	34	32.2	31.3	30.0	30.1
15	Roadside	N	36	32.7	30.6	29.8	29.8
16	Roadside	N	**41**	35.2	33.7	34.1	32.8
17	Roadside	N	35	31.0	32.9	35.2	33.9
20	Roadside	N	**42**	36.0	34.4	34.0	34.1
21	Roadside	N	34	30.4	30.8	35.6	39.5
23	Roadside	N	36	31.4	30.6	29.2	27.4
34	Roadside	N	-	**46.6**	**46.7**	**47.5**	**46.6**

In bold, exceedence of the NO_2 annual mean AQS objective of 40µg/m^3

Underlined, annual mean > 60µg/m^3, indicating a potential exceedence of the NO_2 hourly mean AQS objective

[a] Means should be "annualised" as in Boxes 7.9 and 7.10 of LAQM.TG16, if full calendar year data capture is less than 75%

Figure 6 – Trends in Annual Mean Nitrogen Dioxide Concentrations Measured at Diffusion Tube Monitoring Sites



The sites that have failed to meet the annual averaged air quality objective during the last five years have been some of those located at Victoria Gardens or Pontardawe Post Office.

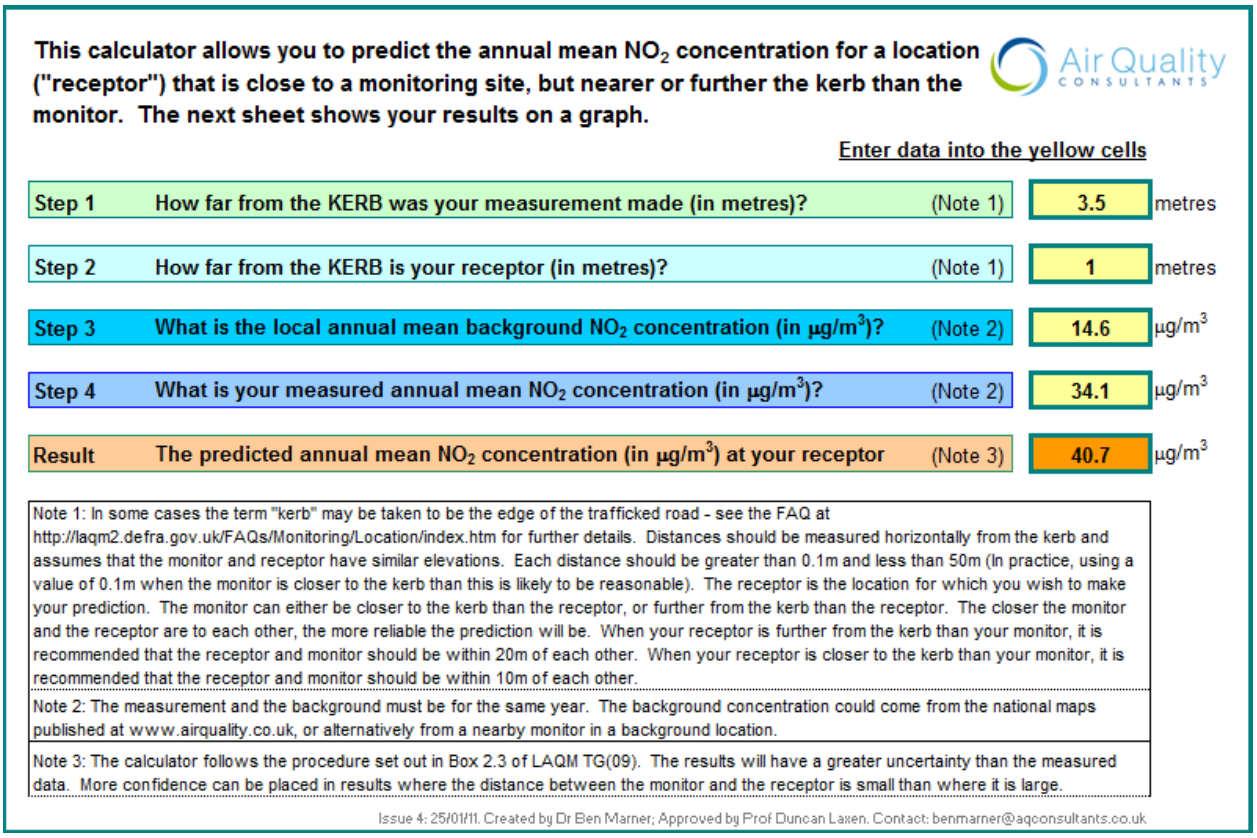
Monitoring at 1 Victoria Gardens had to cease on account of health & safety concerns since the pavement was very low and narrow and it was considered to be dangerous to use the ladder to exchange the tubes. The property next door at 3, Victoria Gardens continues to be measured and is used to estimate NO_2 levels at No.1 Victoria Gardens. Therefore it is necessary to estimate the pollution level at this property using the "NO_2 with distance from roads calculator" spreadsheet.

No. 3 is set back approximately 3.5 metres from the kerb, whereas the frontage at No. 1 faces directly onto the pavement.

The background maps spreadsheet for NO_2 for Neath Port Talbot for the year of 2015 was downloaded from http://uk-air.defra.gov.uk/data/laqm-background-maps?year=2011 . The nearest location to the junction at Victoria Gardens and Cimla Road was defined by the coordinates 275500, 197500. The background NO_2 concentration at this location is 14.6 $\mu g/m^3$.

The data entered into the spreadsheet is shown below:

Figure 7- Screenshot of NO_2 with distance calculator spreadsheet



This calculator allows you to predict the annual mean NO_2 concentration for a location ("receptor") that is close to a monitoring site, but nearer or further the kerb than the monitor. The next sheet shows your results on a graph.

Air Quality CONSULTANTS

Enter data into the yellow cells

Step 1	How far from the KERB was your measurement made (in metres)?	(Note 1)	3.5	metres
Step 2	How far from the KERB is your receptor (in metres)?	(Note 1)	1	metres
Step 3	What is the local annual mean background NO_2 concentration (in µg/m^3)?	(Note 2)	14.6	µg/m^3
Step 4	What is your measured annual mean NO_2 concentration (in µg/m^3)?	(Note 2)	34.1	µg/m^3
Result	The predicted annual mean NO_2 concentration (in µg/m^3) at your receptor	(Note 3)	40.7	µg/m^3

Note 1: In some cases the term "kerb" may be taken to be the edge of the trafficked road - see the FAQ at http://laqm2.defra.gov.uk/FAQs/Monitoring/Location/index.htm for further details. Distances should be measured horizontally from the kerb and assumes that the monitor and receptor have similar elevations. Each distance should be greater than 0.1m and less than 50m (In practice, using a value of 0.1m when the monitor is closer to the kerb than this is likely to be reasonable). The receptor is the location for which you wish to make your prediction. The monitor can either be closer to the kerb than the receptor, or further from the kerb than the receptor. The closer the monitor and the receptor are to each other, the more reliable the prediction will be. When your receptor is further from the kerb than your monitor, it is recommended that the receptor and monitor should be within 20m of each other. When your receptor is closer to the kerb than your monitor, it is recommended that the receptor and monitor should be within 10m of each other.

Note 2: The measurement and the background must be for the same year. The background concentration could come from the national maps published at www.airquality.co.uk, or alternatively from a nearby monitor in a background location.

Note 3: The calculator follows the procedure set out in Box 2.3 of LAQM TG(09). The results will have a greater uncertainty than the measured data. More confidence can be placed in results where the distance between the monitor and the receptor is small than where it is large.

Issue 4: 25/01/11. Created by Dr Ben Marner; Approved by Prof Duncan Laxen. Contact: benmarner@aqconsultants.co.uk

This shows that the annual averaged air quality objective at 1 Victoria Gardens did not comply with the air quality objective i.e. 40.7 µg/m^3.

Monitoring has been carried out at several properties in the vicinity of the junction, therefore dispersion modelling is considered to be unnecessary for purposes of identifying the geographical area of any potential exceedance.

Conclusion

Measurements have shown that the only location having relevant exposure where the annual averaged AQO was breached was No. 1 Victoria Gardens (40.7 ug/m^3). However, this exceedance is marginal and is based upon the use of the NO2 with distance calculator spreadsheet. This will have introduced an additional degree of uncertainty over and above that introduced by the use of diffusion tubes (albeit in triplicate) at No. 3 Victoria Gardens.

The aim of the Detailed Assessment is to establish with reasonable certainty whether there is a likelihood that AQOs are not being achieved. It is considered that this result is not sufficient in this regard and that an AQMA will not be declared at this time.

The Council therefore intends to deploy diffusion tubes in triplicate at No. 1 Victoria Gardens using circular clips which will allow deployment without the need for ladders. This will overcome the previous health and safety limitation on monitoring at this location and will eliminate the additional uncertainty introduced by the NO2 with distance calculator spreadsheet. A further Detailed Assessment of NO2 shall then be carried out on 2016 data.

Appendix A: QA/QC Data

Diffusion Tube Bias Adjustment Factors

NO_2 diffusion tubes are sourced from the Environmental Scientifics Group and are prepared using 50% TEA in acetone. The bias adjustment factor of 0.78 was used for 2014, as derived from a co-location study at three locations.

Factor from Local Co-location Studies (if available)

Continuous analysers were co-located with triplicate diffusion tubes at Port Talbot Fire Station, Pontardawe Swansea Road and Victoria Gardens.

Defra has provided a spreadsheet to facilitate the calculation of local bias adjustment factors. The spreadsheet used can be found at this location:

http://laqm.defra.gov.uk/bias-adjustment-factors/local-bias.html

Figure A1 – Pontardawe Post Office - Bias adjustment spreadsheet -

Checking Precision and Accuracy of Triplicate Tubes

AEA Energy & Environment
From the AEA group

Diffusion Tubes Measurements

Period	Start Date dd/mm/yyyy	End Date dd/mm/yyyy	Tube 1 µgm^{-3}	Tube 2 µgm^{-3}	Tube 3 µgm^{-3}	Triplicate Mean	Standard Deviation	Coefficient of Variation (CV)	95% CI of mean	Automatic Method: Period Mean	Automatic Method: Data Capture (% DC)	Data Quality Check: Tubes Precision Check	Data Quality Check: Automatic Monitor Data
1	08/01/2015	05/02/2015	30.3	31.0	27.0	29	2.1	7	5.3	28.1034	100	Good	Good
2	05/02/2015	05/03/2015	26.8	30.0	28.8	29	1.6	6	4.0	27.7143	100	Good	Good
3	05/03/2015	01/04/2015	27.0	25.4	27.1	27	1.0	4	2.4	24.7778	100	Good	Good
4	01/04/2015	30/04/2015	24.4	25.8	24.8	25	0.7	3	1.8	21.7778	93.103448	Good	Good
5	30/04/2015	28/05/2015	18.5	17.1	18.8	18	0.9	5	2.3	16	100	Good	Good
6	28/05/2015	02/07/2015	16.7	18.7	18.8	18	1.2	7	2.9	15	100	Good	Good
7	02/07/2015	30/07/2015	17.7	15.4	16.2	16	1.2	7	2.9	14	100	Good	Good
8	30/07/2015	26/08/2015	16.8	15.2	18.4	17	1.6	10	4.0	16	100	Good	Good
9	26/08/2015	30/09/2015	19.8	23.1	21.1	21	1.7	8	4.1	21	97.142857	Good	Good
10	30/09/2015	28/10/2015	26.1	26.2	24.3	26	1.1	4	2.7	24	92.857143	Good	Good
11	28/10/2015	16/12/2015	21.8	24.2	25.1	24	1.7	7	4.2	20	100	Good	Good
12	16/12/2015	06/01/2016	22.8	23.3	51.5	33	16.4	50	40.8	20.7097	100	Poor Precision	Good
13													
											Overall survey -->	Good precision	Good Overall

It is necessary to have results for at least two tubes in order to calculate the precision of the measurements

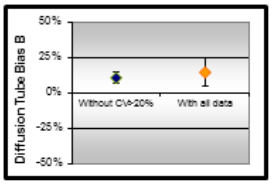
(Check average CV & DC from Accuracy calculations)

Site Name/ ID: Pontardawe PO 2015

Precision: 11 out of 12 periods have a CV smaller than 20%

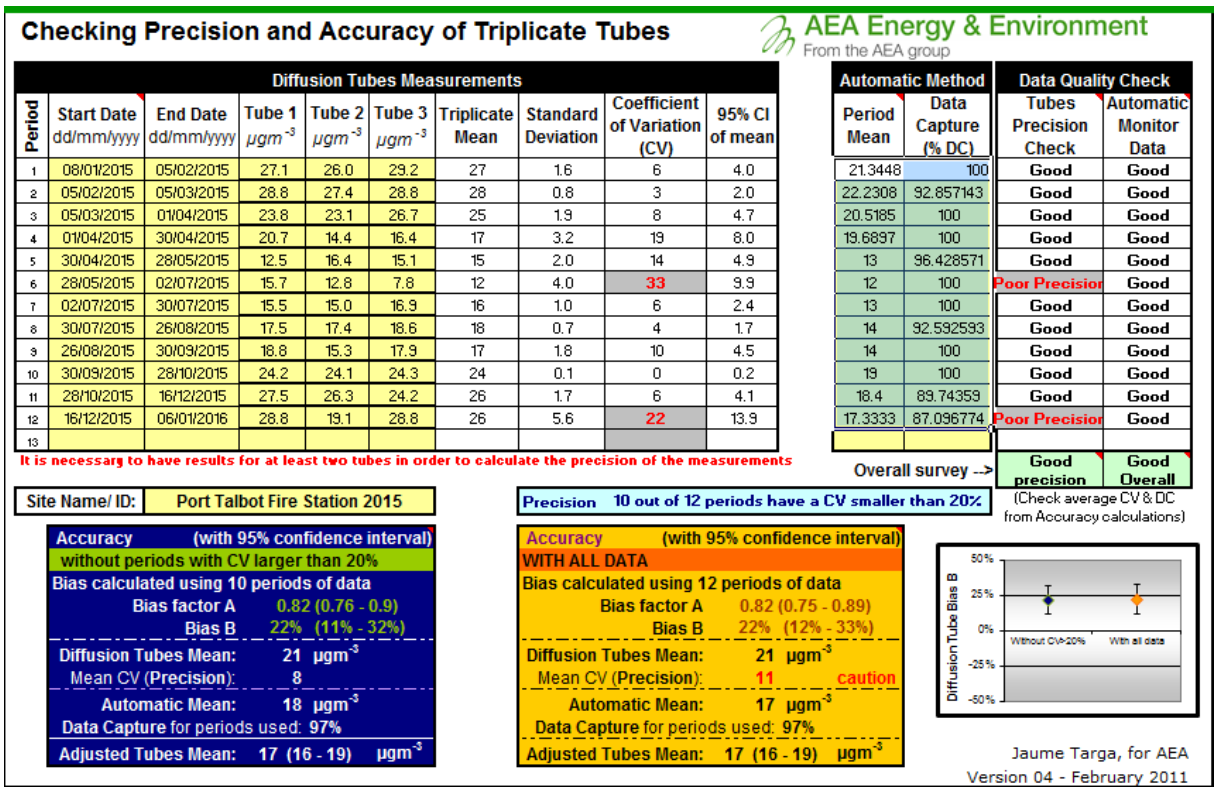
Accuracy (with 95% confidence interval) without periods with CV larger than 20%
Bias calculated using 11 periods of data
Bias factor A: 0.91 (0.88 - 0.95)
Bias B: 10% (5% - 14%)
Diffusion Tubes Mean: 23 µgm^{-3}
Mean CV (Precision): 6
Automatic Mean: 21 µgm^{-3}
Data Capture for periods used: 98%
Adjusted Tubes Mean: 21 (20 - 22) µgm^{-3}

Accuracy (with 95% confidence interval) WITH ALL DATA
Bias calculated using 12 periods of data
Bias factor A: 0.88 (0.81 - 0.97)
Bias B: 13% (3% - 23%)
Diffusion Tubes Mean: 24 µgm^{-3}
Mean CV (Precision): 10
Automatic Mean: 21 µgm^{-3}
Data Capture for periods used: 99%
Adjusted Tubes Mean: 21 (19 - 23) µgm^{-3}



Jaume Targa, for AEA
Version 04 - February 2011

Figure A2 – Port Talbot Fire Station - Bias adjustment spreadsheet -



Checking Precision and Accuracy of Triplicate Tubes

AEA Energy & Environment
From the AEA group

Diffusion Tubes Measurements

Period	Start Date dd/mm/yyyy	End Date dd/mm/yyyy	Tube 1 µgm^{-3}	Tube 2 µgm^{-3}	Tube 3 µgm^{-3}	Triplicate Mean	Standard Deviation	Coefficient of Variation (CV)	95% CI of mean
1	08/01/2015	05/02/2015	27.1	26.0	29.2	27	1.6	6	4.0
2	05/02/2015	05/03/2015	28.8	27.4	28.8	28	0.8	3	2.0
3	05/03/2015	01/04/2015	23.8	23.1	26.7	25	1.9	8	4.7
4	01/04/2015	30/04/2015	20.7	14.4	16.4	17	3.2	19	8.0
5	30/04/2015	28/05/2015	12.5	16.4	15.1	15	2.0	14	4.9
6	28/05/2015	02/07/2015	15.7	12.8	7.8	12	4.0	33	9.9
7	02/07/2015	30/07/2015	15.5	15.0	16.9	16	1.0	6	2.4
8	30/07/2015	26/08/2015	17.5	17.4	18.6	18	0.7	4	1.7
9	26/08/2015	30/09/2015	18.8	15.3	17.9	17	1.8	10	4.5
10	30/09/2015	28/10/2015	24.2	24.1	24.3	24	0.1	0	0.2
11	28/10/2015	16/12/2015	27.5	26.3	24.2	26	1.7	6	4.1
12	16/12/2015	06/01/2016	28.8	19.1	28.8	26	5.6	22	13.9
13									

It is necessary to have results for at least two tubes in order to calculate the precision of the measurements

Automatic Method		Data Quality Check	
Period Mean	Data Capture (% DC)	Tubes Precision Check	Automatic Monitor Data
21.3448	100	Good	Good
22.2308	92.857143	Good	Good
20.5185	100	Good	Good
19.6897	100	Good	Good
13	96.428571	Good	Good
12	100	Poor Precision	Good
13	100	Good	Good
14	92.592593	Good	Good
14	100	Good	Good
19	100	Good	Good
18.4	89.74359	Good	Good
17.3333	87.096774	Poor Precision	Good
Overall survey -->		Good precision	Good Overall

(Check average CV & DC from Accuracy calculations)

Site Name/ ID: Port Talbot Fire Station 2015

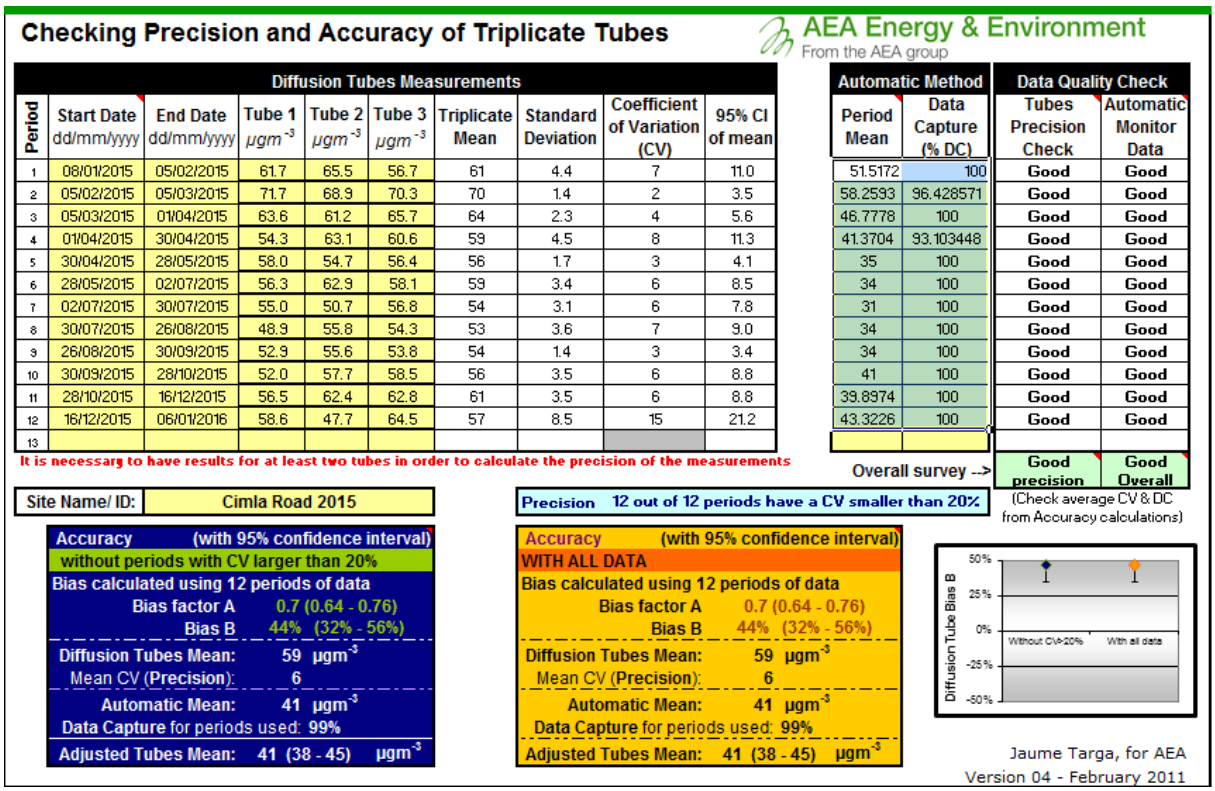
Precision: 10 out of 12 periods have a CV smaller than 20%

Accuracy (with 95% confidence interval)
without periods with CV larger than 20%
Bias calculated using 10 periods of data
Bias factor A: 0.82 (0.76 - 0.9)
Bias B: 22% (11% - 32%)
Diffusion Tubes Mean: 21 µgm^{-3}
Mean CV (Precision): 8
Automatic Mean: 18 µgm^{-3}
Data Capture for periods used: 97%
Adjusted Tubes Mean: 17 (16 - 19) µgm^{-3}

Accuracy (with 95% confidence interval)
WITH ALL DATA
Bias calculated using 12 periods of data
Bias factor A: 0.82 (0.75 - 0.89)
Bias B: 22% (12% - 33%)
Diffusion Tubes Mean: 21 µgm^{-3}
Mean CV (Precision): 11 caution
Automatic Mean: 17 µgm^{-3}
Data Capture for periods used: 97%
Adjusted Tubes Mean: 17 (16 - 19) µgm^{-3}

Jaume Targa, for AEA
Version 04 - February 2011

Figure A3 – Cimla Road - Bias adjustment spreadsheet -



Checking Precision and Accuracy of Triplicate Tubes

AEA Energy & Environment
From the AEA group

Diffusion Tubes Measurements

Period	Start Date dd/mm/yyyy	End Date dd/mm/yyyy	Tube 1 µgm^{-3}	Tube 2 µgm^{-3}	Tube 3 µgm^{-3}	Triplicate Mean	Standard Deviation	Coefficient of Variation (CV)	95% CI of mean
1	08/01/2015	05/02/2015	61.7	65.5	56.7	61	4.4	7	11.0
2	05/02/2015	05/03/2015	71.7	68.9	70.3	70	1.4	2	3.5
3	05/03/2015	01/04/2015	63.6	61.2	65.7	64	2.3	4	5.6
4	01/04/2015	30/04/2015	54.3	63.1	60.6	59	4.5	8	11.3
5	30/04/2015	28/05/2015	58.0	54.7	56.4	56	1.7	3	4.1
6	28/05/2015	02/07/2015	56.3	62.9	58.1	59	3.4	6	8.5
7	02/07/2015	30/07/2015	55.0	50.7	56.8	54	3.1	6	7.8
8	30/07/2015	26/08/2015	48.9	55.8	54.3	53	3.6	7	9.0
9	26/08/2015	30/09/2015	52.9	55.6	53.8	54	1.4	3	3.4
10	30/09/2015	28/10/2015	52.0	57.7	58.5	56	3.5	6	8.8
11	28/10/2015	16/12/2015	56.5	62.4	62.8	61	3.5	6	8.8
12	16/12/2015	06/01/2016	58.6	47.7	64.5	57	8.5	15	21.2
13									

It is necessary to have results for at least two tubes in order to calculate the precision of the measurements

Automatic Method		Data Quality Check	
Period Mean	Data Capture (% DC)	Tubes Precision Check	Automatic Monitor Data
51.5172	100	Good	Good
58.2593	96.428571	Good	Good
46.7778	100	Good	Good
41.3704	93.103448	Good	Good
35	100	Good	Good
34	100	Good	Good
31	100	Good	Good
34	100	Good	Good
34	100	Good	Good
41	100	Good	Good
39.8974	100	Good	Good
43.3226	100	Good	Good
Overall survey -->		Good precision	Good Overall

(Check average CV & DC from Accuracy calculations)

Site Name/ ID: Cimla Road 2015

Precision: 12 out of 12 periods have a CV smaller than 20%

Accuracy (with 95% confidence interval)
without periods with CV larger than 20%
Bias calculated using 12 periods of data
Bias factor A: 0.7 (0.64 - 0.76)
Bias B: 44% (32% - 56%)
Diffusion Tubes Mean: 59 µgm^{-3}
Mean CV (Precision): 6
Automatic Mean: 41 µgm^{-3}
Data Capture for periods used: 99%
Adjusted Tubes Mean: 41 (38 - 45) µgm^{-3}

Accuracy (with 95% confidence interval)
WITH ALL DATA
Bias calculated using 12 periods of data
Bias factor A: 0.7 (0.64 - 0.76)
Bias B: 44% (32% - 56%)
Diffusion Tubes Mean: 59 µgm^{-3}
Mean CV (Precision): 6
Automatic Mean: 41 µgm^{-3}
Data Capture for periods used: 99%
Adjusted Tubes Mean: 41 (38 - 45) µgm^{-3}

Jaume Targa, for AEA
Version 04 - February 2011

The locally derived bias adjustment factor of 0.80 is derived from the average of the three sites e.g. (0.88 + 0.82 + 0.7) / 3.

PM Monitoring Adjustment

No PM adjustment was required for PM_{10} analysers operated by Neath Port Talbot County Borough Council as FDMS TEOMs were used in all cases.

Short-term to Long-term Data adjustment

No data was lost in monitoring diffusion tube sites during 2015. Consequently, no long-term data adjustment was necessary.

QA/QC of automatic monitoring

The AURN site is subject to the quality control procedures of the network. Neath Port Talbot County Borough Council staff act as Local Site Operator, carrying out calibrations on an approximately fortnightly basis. There are regular site audits and validation and ratification are carried out by AURN staff prior to dissemination of the data via http://uk-air.defra.gov.uk/ .

All PM_{10} analysers are FDMS/TEOMs with C/B driers. No factors are applied to this data during the collection process. All equipment is covered by service and maintenance contracts with suppliers. These contracts provide for 6 monthly servicing and emergency callouts.

Monitoring stations are covered by a QA/QC contract with Ricardo-AEA which provides for two site audits per year and QA/QC of the data which is polled by AEAT and disseminated on the Welsh Air Quality Forum website. Data is subject to a similar QA/QC standard as the AURN.

QA/QC of diffusion tube monitoring

Harwell Scientifics have been shown to have good performance in respect of recent Wasp scheme analyses. Details of the most recent Wasp results can be viewed at the following Internet location:

http://laqm.defra.gov.uk/documents/LAQM-WASP-Rounds-121--124-and-AIR-PT-Rounds-1-3-4-6-(April-2013--February-2015)-NO2-report.pdf

Appendix B: Raw NO2 Data

Site Id	Month/Year	NO2 Conc ug
4	1/2015	34.9
4	2/2015	41.9
4	3/2015	38.0
4	4/2015	34.0
4	5/2015	19.8
4	6/2015	26.7
4	7/2015	25.7
4	8/2015	28.0
4	9/2015	30.5
4	10/2015	41.7
4	11/2015	34.4
4	12/2015	32.4
5	1/2015	50.5
5	2/2015	51.3
5	3/2015	42.6
5	4/2015	32.3
5	5/2015	31.9
5	6/2015	30.1
5	7/2015	31.3
5	8/2015	27.5
5	9/2015	37.4
5	10/2015	41.5
5	11/2015	41.7
5	12/2015	28.4
12	1/2015	50.3
12	2/2015	48.6
12	3/2015	42.2
12	4/2015	34.6
12	5/2015	29.8
12	6/2015	29.6
12	7/2015	27.8
12	8/2015	29.4
12	9/2015	35.7
12	10/2015	39.9
12	11/2015	37.1
12	12/2015	31.5
13	1/2015	50.9
13	2/2015	44.5
13	3/2015	37.4
13	4/2015	29.2
13	5/2015	28.0

Site Id	Month/Year	NO2 Conc ug
13	6/2015	27.3
13	7/2015	25.9
13	8/2015	25.2
13	9/2015	30.9
13	10/2015	35.1
13	11/2015	31.3
13	12/2015	28.6
14	1/2015	55.7
14	2/2015	48.0
14	3/2015	45.9
14	4/2015	31.7
14	5/2015	30.9
14	6/2015	30.1
14	7/2015	30.5
14	8/2015	32.4
14	9/2015	36.1
14	10/2015	41.7
14	11/2015	39.9
14	12/2015	30.1
15	1/2015	49.5
15	2/2015	56.8
15	3/2015	45.1
15	4/2015	34.9
15	5/2015	31.3
15	6/2015	28.6
15	7/2015	31.5
15	8/2015	28.6
15	9/2015	34.9
15	10/2015	36.5
15	11/2015	40.3
15	12/2015	30.7
16	1/2015	54.0
16	2/2015	54.7
16	3/2015	45.5
16	4/2015	36.5
16	5/2015	35.5
16	6/2015	35.9
16	7/2015	31.1
16	8/2015	35.3
16	9/2015	40.1
16	10/2015	36.9
16	11/2015	47.4
16	12/2015	41.5

Site Id	Month/Year	NO2 Conc ug
17	1/2015	43.8
17	2/2015	53.2
17	3/2015	46.7
17	4/2015	43.0
17	5/2015	31.5
17	6/2015	34.9
17	7/2015	35.1
17	8/2015	34.6
17	9/2015	42.4
17	10/2015	47.6
17	11/2015	48.2
17	12/2015	49.9
20	1/2015	56.1
20	2/2015	50.1
20	3/2015	47.0
20	4/2015	40.3
20	5/2015	38.8
20	6/2015	37.6
20	7/2015	38.6
20	8/2015	35.7
20	9/2015	39.0
20	10/2015	40.1
20	11/2015	46.8
20	12/2015	44.9
21	1/2015	64.5
21	2/2015	64.1
21	3/2015	47.8
21	4/2015	46.3
21	5/2015	33.0
21	6/2015	38.6
21	7/2015	43.2
21	8/2015	45.5
21	9/2015	49.2
21	10/2015	55.3
21	11/2015	55.3
21	12/2015	53.4
23	1/2015	37.8
23	2/2015	39.9
23	3/2015	41.3
23	4/2015	33.2
23	5/2015	27.6
23	6/2015	28.6
23	7/2015	25.3

Site Id	Month/Year	NO2 Conc ug
23	8/2015	29.4
23	9/2015	32.3
23	10/2015	44.2
23	11/2015	38.8
23	12/2015	34.8
34	1/2015	61.2
34	2/2015	70.3
34	3/2015	63.4
34	4/2015	59.1
34	5/2015	56.3
34	6/2015	58.9
34	7/2015	54.1
34	8/2015	52.8
34	9/2015	54.0
34	10/2015	55.9
34	11/2015	60.5
34	12/2015	56.8