



# **Merthyr Tydfil County Borough Council**

## **2016 Air Quality Progress Report**

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

January 2017

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## Crynodeb Gweithredol

Mae'r adroddiad hwn yn cyflawni gofynion proses Rheoli Ansawdd yr Aer yn Lleol fel y'i gosodwyd yn Rhan IV Deddf yr Amgylchedd (1995), Strategaeth Ansawdd Aer ar gyfer Cymru, Lloegr a Gogledd Iwerddon 2007 a'r dogfennau perthnasol o ran Polisi a Chanllawiau Technegol.

Mae proses Rheoli Ansawdd yr Aer yn Lleol yn gosod gorfodaeth ar holl awdurdodau lleol i adolygu ac asesu ansawdd aer yn rheolaidd yn eu hardaloedd, a phennu a yw nodau ansawdd yr aer yn debygol o gael eu cyflawni. Os ystyrir bod gormodiant yn debygol, rhaid i'r awdurdod lleol ddatgan Ardal Rheoli Ansawdd yr Aer a pharatoi Cynllun Gweithredu Ansawdd yr Aer yn gosod allan y mesurau y mae'n bwriadau eu rhoi mewn lle er mwyn ymlid y nodau. Gan fod gormodiant wedi ei ganfod yn ardal Heol Twynrodyn, cafodd asesiad manwl ei gyflawni ym mis Tachwedd 2015; ac ar 30 Ionawr 2017 cafodd Ardal Rheoli Ansawdd yr Aer ei chyhoeddi. Mae Cynllun Rheoli Ansawdd yr Aer yn cael ei baratoi ar gyfer ymgynghoriad.

Dynododd tiwbiau trylediad fod lefelau

## Executive Summary

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 exceedances 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. As exceedances have been detected in the Twynrodyn Road area, a detailed assessment was carried out in November 2015 and on 30<sup>th</sup> January 2017 an AQMA was declared. An AQAP is being prepared for consultation.

Diffusion tubes indicated that nitrogen dioxide levels found at sites around 55 Twynrodyn Road exceeding the annual

nitrogen deuocsid i'w canfod ar safleoedd o gwmpas Heol Twynrodyn sy'n rhagori ar gymedr blynyddol Nod Ansawdd yr Aer yn debyg i ganlyniadau yn 2014. Rhagwelir, pan fydd mesurau i leihau prysurdeb y traffig a gwella llif y traffig ar Heol Twynrodyn wedi eu gosod yn eu lle, y bydd crynodiadau NO<sub>2</sub> yn lleihau, gyda'r nod o gyflawni crynodiadau na fyddant yn fwy na 36mg/m<sup>3</sup>.

Ceir dau ddatblygiad sydd â'r potensial i effeithio ar ansawdd aer. Yn gyntaf, mae model wedi ei gyflawni fel rhan o'r cais cynllunio i adeiladu gorsaf fysiau newydd ar Stryd yr Alarch. Y mae'n dynodi y bydd cydsynio â Nod Ansawdd yr Aer NO<sub>2</sub>. Mae'n defnyddio tiwb trylediad 6 mis, fodd bynnag, mae hyn yn cynnwys llai na 3 mis o ddata gaeaf. Bwriad CBSMT yw cadarnhau'r rhagolygon a wnaed gan y model gan ddefnyddio tiwbiau trylediad pan fydd yr orsaf fysiau yn dechrau gweithredu. Yn ail, mae gwaith adeiladu datblygiad manwerthu Melinau Trago Mills yn mynd rhagddo. Mae datblygiadau tebyg yn Ne-orllewin Lloegr wedi arwain at dagfa a chynnydd mewn NO<sub>2</sub> unwaith y bydd yn cael ei ddefnyddio. Bydd tiwb trylediad yn cael ei agor ar Heol Abertawe i fonitro hyn.

#### Merthyr Tydfil County Borough Council

mean air quality objective (AQO) were similar to results in 2014. It is predicted once measures to reduce traffic numbers and improve traffic flow on Twynrodyn Road are implemented the NO<sub>2</sub> concentrations will reduce, with an aim of achieving concentrations of not more than 36µg/m<sup>3</sup>.

There are two new developments with the potential to affect air quality. Firstly modelling has been carried out as part of a planning application to build a new bus station at Swan Street. It indicates the NO<sub>2</sub> AQO will be complied with. It uses 6 months diffusion tube data, however this comprises less than 3 months winter data. MTCBC intends to confirm the predictions made by the model using diffusion tubes when the bus station begins operating. Secondly Trago Mills retail development is under construction. Similar developments in the South West of England have resulted in congestion and elevated NO<sub>2</sub> once in use. A diffusion tube on Swansea Road will be opened to monitor this.

**Glossary**

AQAP	Air Quality Action Plan
AQMA	Air Quality Management Area
AQO	Air Quality Objective
AQ	Air Quality
AURN	Automatic Urban and Rural (air quality monitoring) Network
CO	Carbon monoxide
DA	Detailed Assessment
DEFRA	Department for Environment Food and Rural Affairs
ECC	Electrochemical Cell
LAQM	Local Air Quality Management
mg/m <sup>3</sup>	Milligrams of the pollutant per cubic metre of air
µg/m <sup>3</sup>	Micrograms of the pollutant per cubic metre of air
MTCBC	Merthyr Tydfil County Borough Council
NO	Nitric oxide
NO <sub>2</sub>	Nitrogen dioxide
NOx	Nitrogen oxides
O <sub>3</sub>	Ozone
PM <sub>10</sub>	Particles with diameter less than 10µm
PM <sub>2.5</sub>	Particles with diameter less than 2.5µm
QA/QC	Quality Assurance / Quality Control
SO <sub>2</sub>	Sulphur dioxide
TEOM	Tapered Element Oscillating Microbalance
USA	Updating and Screening Assessment
WAQF	Welsh Air Quality Forum

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# **1 Introduction**

## **1.1 Description of Local Authority Area**

Merthyr Tydfil County Borough Council (MTCBC) is the Local Authority for the town of Merthyr Tydfil and various outlying towns and villages from the Northern part of the Taff Valley and from the Taff Bargoed Valley. The Local Authority consists of 11 wards covering a population of approximately 55,000.

Merthyr Tydfil is a town at the head of the Taff Valley approximately 20 miles north of Cardiff. It has a population of approximately 30,000, and is the main settlement covered by MTCBC. Pentrebach and Dowlais are the main industrialised areas of the town and on the outskirts are the areas of Cefn Coed, Trefechan, and Abercanaid with the village of Pontsticill further out in the Northern part of the Borough where it is part of the Brecon Beacons National Park. In the south of the Borough are Treharris, a former colliery town, and the nearby former colliery villages of Trelewis, Bedlinog and Edwardsville. The villages of Merthyr Vale, Troedyrhiw and Aberfan are also situated in the south located on the River Taff.

The A470 and A465 are the major road links in the Valley. The A470 runs from Cardiff to Llandudno passing through the Borough to the west of the Merthyr Tydfil town. The section within the Borough is a dual carriageway road extensively used by commuters. The A465, known as the Heads of the Valleys Road, is located to the north of the town and within the Borough is mainly single carriageway at this time. There is an ongoing Welsh Government project to develop it to dual carriageway, which will affect Merthyr Tydfil within the new future. The A470 and A465 connect to the north-west of the town but are also linked by the A4060, mainly dual-carriageway, which passes the town on the eastern side. There are few residential properties in close proximity to these roads. The A4060 is linked to the town centre by Twynrodyn Road which has relatively high traffic flows as a result.

Historically Merthyr Tydfil has played a large part in the industrial activity of South Wales, with steel works, iron works and coal mining operations. This, however, has declined dramatically over the last 50 years or so and today there are only a few industrial processes

within the Borough which require permits for their operation. With the exception of a major coal extraction operation and the three Part A1 processes regulated by Natural Resources Wales these are mainly small Part B processes such as vehicle refinishers, wood processors etc.

Although there are no longer any significant industrial sources in the Borough traffic has increased, particularly on the Twynyrodyn Road link. This is a result of new residential developments on the outskirts of the town towards the A4060 combined with the opening and expansion of retail and leisure facilities in the town centre and the introduction of one way traffic in the town centre affecting the traffic flow on the road network as a whole.

## **1.2 Purpose of Progress Report**

This report fulfils the requirements of the Local Air Quality Management (LAQM) 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.

For Local Authorities in Wales, Progress Reports are required in the intervening years between the three-yearly Updating and Screening Assessment reports. Their purpose is to maintain continuity in the LAQM process.

They are not intended to be as detailed as Updating and Screening Assessment Reports, or to require as much effort. However, if the Progress Report identifies the risk of exceedence of an Air Quality Objective, the Local Authority (LA) should undertake a Detailed Assessment immediately, and not wait until the next round of Review and Assessment.

### 1.3 Air Quality Objectives

The air quality objectives applicable to LAQM in Wales are set out in the Air Quality (Wales) Regulations 2000, No. 1940 (Wales 138), Air Quality (Amendment) (Wales) Regulations 2002, No 3182 (Wales 298), and are shown in Table 1.1. This table shows the objectives in units of microgrammes per cubic metre,  $\mu\text{g}/\text{m}^3$  (milligrammes per cubic metre,  $\text{mg}/\text{m}^3$  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 LAQM in Wales**

Pollutant	Air Quality Objective		Date to be achieved by
	Concentration	Measured as	
Benzene	16.25 $\mu\text{g}/\text{m}^3$	Running annual mean	31.12.2003
	5.00 $\mu\text{g}/\text{m}^3$	Annual mean	31.12.2011
1,3-butadiene	2.25 $\mu\text{g}/\text{m}^3$	Running annual mean	31.12.2003
Carbon monoxide	10 $\text{mg}/\text{m}^3$	Running 8-hour mean	31.12.2003
Lead	0.50 $\mu\text{g}/\text{m}^3$	Annual mean	31.12.2004
	0.25 $\mu\text{g}/\text{m}^3$	Annual mean	31.12.2008
Nitrogen dioxide	200 $\mu\text{g}/\text{m}^3$ not to be exceeded more than 18 times a year	1-hour mean	31.12.2005
	40 $\mu\text{g}/\text{m}^3$	Annual mean	31.12.2005
Particulate matter (PM <sub>10</sub> ) (gravimetric)	50 $\mu\text{g}/\text{m}^3$ , not to be exceeded more than 35 times a year	24-hour mean	31.12.2004
	40 $\mu\text{g}/\text{m}^3$	Annual mean	31.12.2004
Sulphur dioxide	350 $\mu\text{g}/\text{m}^3$ , not to be exceeded more than 24 times a year	1-hour mean	31.12.2004
	125 $\mu\text{g}/\text{m}^3$ , not to be exceeded more than 3 times a year	24-hour mean	31.12.2004
	266 $\mu\text{g}/\text{m}^3$ , not to be exceeded more than 35 times a year	15-minute mean	31.12.2005

## **1.4 Summary of Previous Review and Assessments**

MTCBC has previously undertaken the following review and assessment reports as required by Local Air Quality Management:

### **First Stage Review and Assessment - 1998**

- This concluded there was a negligible risk of air quality objectives (AQOs) for benzene, 1,3-butadiene, CO and lead being exceeded in the area. There was a possible risk of objectives for PM<sub>10</sub>, SO<sub>2</sub>, and NO<sub>2</sub> being exceeded. On this basis further review and assessment was necessary.

### **Second Stage Review and Assessment – 2000**

- This concluded there was a negligible risk of AQOs for PM<sub>10</sub>, SO<sub>2</sub> and NO<sub>2</sub> being exceeded in the area. It was considered unnecessary to proceed any further with the review and assessment process or to declare any AQMAs.

### **Updating and Screening Assessment and Progress Reports – 2003 - 2005**

- AQOs for the seven pollutants detailed in the regulations were likely to be met at all locations with relevant public exposure. It was considered unnecessary to carry out a detailed risk assessment or declare any AQMAs.
- The progress reports 2004 and 2005 found no significant changes in air quality and no developments that might affect air quality within the Borough.

### **Updating and Screening Assessment and Progress Reports – 2006 - 2008**

- AQOs for the seven pollutants detailed in the regulations were likely to be met at all locations with relevant public exposure. It was considered unnecessary to carry out a detailed risk assessment or declare any AQMAs.
- The Progress Report 2007 found NO<sub>2</sub> levels had increased but within the annual air quality objective of 40 µg/m<sup>3</sup> at all locations. However, levels at WAQF 29, 55 Twynyrodyn Road, were within 10% of the limit and the monitoring network was expanded in this area.

- The Progress Report 2008 found NO<sub>2</sub> levels had increased and at WAQF 29, 55 Twynroddyn Road, a marginal exceedance was identified. It was considered necessary to proceed to detailed assessment for NO<sub>2</sub> in this area.

#### **Detailed Assessment - 2009**

- This reviewed the data for the monitoring sites on Twynroddyn Road (WAQF 29, 29A and 29B) and modelled NO<sub>2</sub> levels for the length of the road. It recommended the siting of additional diffusion tubes at various points on the road and the declaration of AQMA.

#### **Updating and Screening Assessment and Progress Reports – 2009 - 2011**

- AQOs for the seven pollutants detailed in the regulations were met at all locations with relevant public exposure. Based on the reduction it was considered no longer necessary to carry out further detailed risk assessments or declare any AQMAs.
- There were two new permitted installations and one substantially changed installation; detailed assessments were considered to be necessary for these processes.
- The Progress Report 2010 found a decrease in NO<sub>2</sub> monitored levels and no exceedances of the annual air quality objective. As a result, although the detailed assessment of NO<sub>2</sub> levels around site 29 (undertaken in 2009 following the recommendations of the 2008 report) had suggested an AQMA should be declared this was deferred.
- The Progress Report 2011 found NO<sub>2</sub> levels had increased within the objective, however at WAQF 29, 55 Twynroddyn Road, an unusually marked exceedance was identified. It was considered necessary to further increase the number of monitoring sites on Twynroddyn Road prior to declaring an AQMA in relation to this site.

#### **Detailed Assessment - 2011**

- This reviewed the emissions data for the Prince Charles Hospital combustion plant (the only site remaining of those identified in the 2009 USA as requiring further study) and modelled NO<sub>2</sub> and SO<sub>2</sub> levels in the vicinity. It concluded that emissions

will not result in any exceedences of the objectives for either pollutant unless the large, on-site emergency diesel generators were to be used for extended periods.

#### **Updating and Screening Assessment and Progress Reports – 2012 - 2014**

- Monitored PM<sub>10</sub> and PM<sub>2.5</sub> level complied with the AQO and proposed AQO respectively.
- There were no new developments, and no proposed developments, which could be considered to adversely affect air quality.
- Of the 24 nitrogen dioxide monitoring sites in the Borough, only one exceeded the annual mean air quality objective and this was at WAQF 29, 55 Twynyrodyn Road.
- As a breach of similar magnitude had occurred at this site in 2010 it concluded that an assessment to determine the extent of the Air Quality Management Area (AQMA) to be declared was necessary.
- The Progress Report 2013 found action taken to reduce nitrogen dioxide levels at WAQF 29, Twynyrodyn Hill, had reduced it to below the annual mean AQO.
- Additional monitoring proposed in previous reports to identify the extent of the area affected established the existence of a further location on the same road link where NO<sub>2</sub> levels exceed the objective and where similar remedial action is required.
- The Progress Report 2014 stated the development of a new bus station was proposed may adversely affect air quality. The department were liaising with the Regeneration Group to ensure air quality was considered as part of the planning process.
- NO<sub>2</sub> levels on Twynyrodyn Hill had increased to exceed air quality standards. It was unclear whether this was temporary and related to a number of ongoing changes to traffic flow. Further monitoring was proposed.
- It was concluded that a declaration of an AQMA for this location and a Detailed Assessment of NO<sub>2</sub> in the defined area was therefore required.

### **Detailed assessment 2015**

- Elevated NO<sub>2</sub> on Twynnyroddyn Road was associated with traffic. Wind speed and direction, and two storey terraced housing without front gardens resulted in nitrogen dioxide accumulating around 55 Twynnyroddyn Road.
- Real time monitoring showed this was predominantly associated with uphill traffic flowing away from the town centre and Tesco supermarket during the early evening.
- It is considered necessary to declare an AQMA from the Western End of Twynnyroddyn Road to 147 Gilfach Cynon. MTCBC will produce an action plan, aiming to reduce NO<sub>2</sub> concentrations. As NO<sub>2</sub> is associated with traffic emissions, solutions to reduce the speed, improve the flow and reduce the amount of traffic will be carried out.
- The Council declared an AQMA on 30<sup>th</sup> January 2017, which is mapped in Figure 1.1.

### **Updating and Screening Assessment and Progress Reports – 2015 – 2017**

- Monitored PM<sub>10</sub> and PM<sub>2.5</sub> levels complied with the AQO and proposed AQO respectively.
- There is a proposed bus station, which could be considered to adversely affect air quality. Modelling indicates it is likely to comply with AQOs. This will be monitored using diffusion tubes, which will be installed in the area prior to the bus station opening.
- Of the NO<sub>2</sub> monitoring sites in the Borough, those in the area of 55 Twynnyroddyn Road exceeded the annual mean air quality objective.
- As stated in the detailed assessment an AQMA was required.



Figure 1.1 – Map of AQMA Boundary





## **2 New Monitoring Data**

### **2.1 Summary of Monitoring Undertaken**

#### **2.1.1 Automatic Monitoring Sites**

##### **Particulate matter (PM<sub>10</sub> and PM<sub>2.5</sub>)**

As a result of planning conditions placed on a local coal extraction process the operators, Miller Argent (South Wales) Ltd, have been monitoring fine particulates, PM<sub>10</sub>, and ultra-fine particulates, PM<sub>2.5</sub>, at a site in the locality since 2007. The air quality monitoring system is intended to determine ambient PM<sub>10</sub> and PM<sub>2.5</sub> concentrations and detect any increases in PM<sub>10</sub> and PM<sub>2.5</sub> resulting from this operation.

Two Tapered Elemental Oscillating Microbalance (TEOM) analysers provide continuous measurements of PM<sub>10</sub> and PM<sub>2.5</sub>. Data is averaged and stored every 15 minutes, then periodically downloaded to a data management system for later analysis. All data is ratified. The instruments are maintained and calibrated by the site developer in accordance with the quality requirements of the DEFRA and the AURN. Quality assurance and quality control procedures are detailed in Appendix B. The system also monitors ambient temperature and barometric pressure, as well as storing data for wind speed and wind direction supplied by remote roof-mounted sensors.

##### **PM<sub>10</sub> and PM<sub>2.5</sub> monitoring location**

The TEOM analysers have been located in the grounds of Twynrodyn Primary school as shown in Figure 2.1. The site location was chosen for the following reasons:

- Distance from opencast site
- Security
- Power supply
- Relevant public exposure

##### **Nitrogen Dioxide**

A real time ECC monitor was installed in January 2014 outside 55 Twynrodyn Road. There was a brief period of stabilisation. Data of a suitable quality was obtained from March 2014 onwards. The intention is to review and relocate the ECC monitor as the action plan

develops, locating it in areas identified as likely to be problematic in any air quality modelling. It is simple to relocate as it has an internal battery rather than an external power supply.

In addition to annual monitoring real time data has been used to examine short term variations in order to assist in identifying the cause(s) of the exceedance. 15 minute summary NO<sub>2</sub> readings have been combined into 1-hour readings and screened for short term exceedances, and data has been compared with traffic data and meteorological data in the detailed assessment (MTCBC, 2015). Modelling indicated the most likely cause of the exceedance is traffic flowing from West to East, from the town/Tesco roundabout along Twynyrodyn Road during the early evening rush hour.

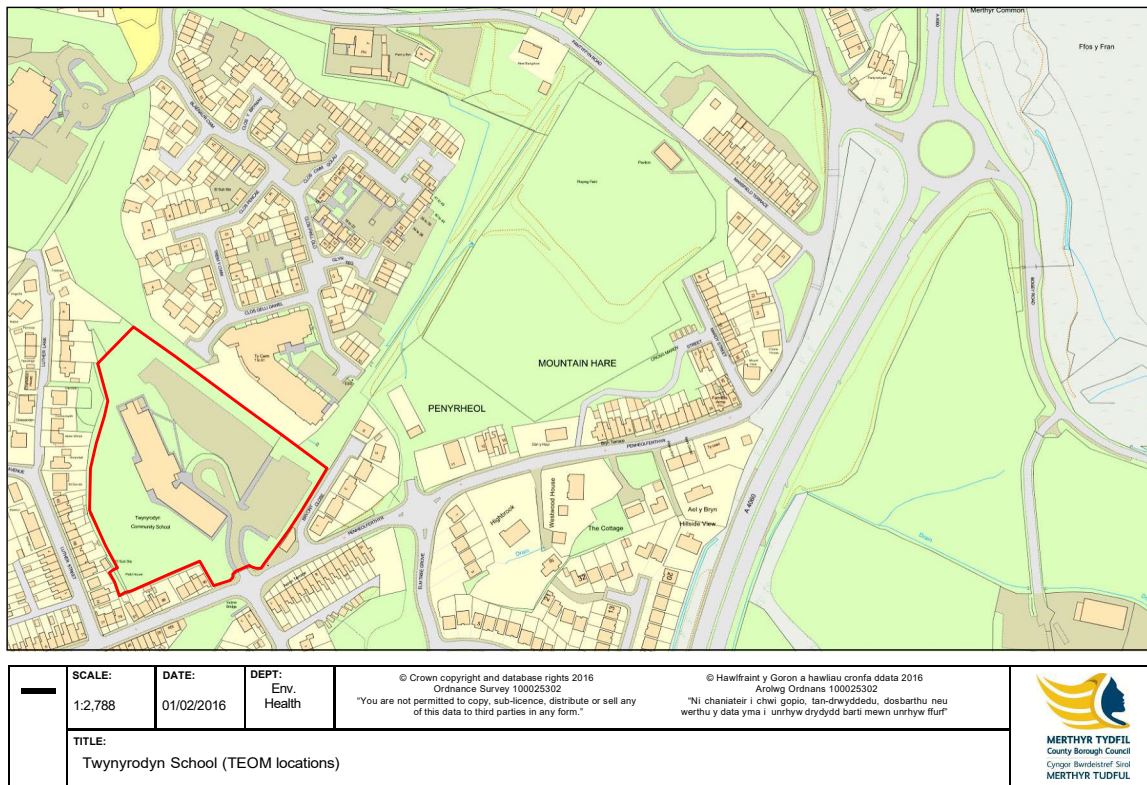
The ECC is a non-standard method of measuring NO<sub>2</sub>. Comparison studies with chemiluminescent monitors show a correlation, however it under-reads NO<sub>2</sub>. As such it is indicative and will only be used in combination with diffusion tubes when making strategic decisions such as whether to modify or revoke the AQMA.

### **Nitrogen dioxide monitoring location**

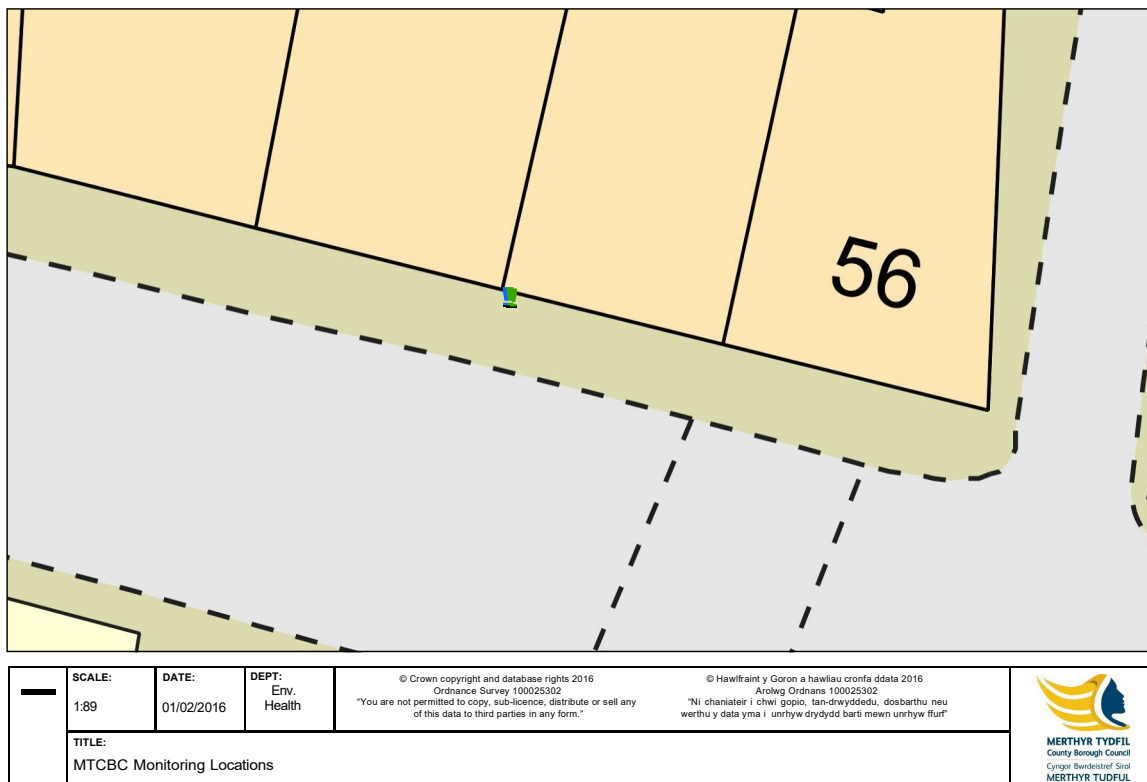
The ECC monitor has been located on a lamppost outside 55 Twynyrodyn Road as shown in Figure 2.2. The site location was chosen for the following reasons:

- Relevant exposure, specifically, location within an area where NO<sub>2</sub> exceeds AQO.
- Colocation with existing NO<sub>2</sub> diffusion tubes.

**Figure 2.1 - Maps of Automatic Monitoring Sites – TEOM operated by Miller Argent**



**Figure 2.2 - Maps of Automatic Monitoring Sites – ECC monitor (blue) and collocated diffusion tubes (green)**



**Table 2.1 – Details of Automatic Monitoring Sites**

<b>Site Name</b>	<b>Site Type</b>	<b>X OS Grid Reference</b>	<b>Y OS Grid Reference</b>	<b>Inlet Height (m)</b>	<b>Pollutants Monitored</b>	<b>In AQMA?</b>	<b>Monitoring Technique</b>	<b>Relevant Exposure? (Y/N with distance (m) from monitoring site to relevant exposure)</b>	<b>Distance to Kerb of Nearest Road (m) (N/A if not applicable)</b>	<b>Does this Location Represent Worst-Case Exposure?</b>
APM1 Twynyrodyn School	Suburban	305821	206008	<b>2.43</b>	PM <sub>10</sub> PM <sub>2.5</sub>	N	TEOM	Y (0m)	N/A	N
ECC	Kerbside	305416	205867	<b>2.75</b>	NO <sub>2</sub>	Y	ECC	Y (1m)	N/A	Y

### **2.1.2 Non-Automatic Monitoring Sites**

MTCBC has operated a network of NO<sub>2</sub> diffusion tube sites across the Borough for a number of years. The majority are located in areas where NO<sub>2</sub> levels are suspected of being elevated but other sites are operated where planning proposals have the potential to influence levels in future, to provide data on general long-term background levels in the area as a whole, or for insight into the fluctuation of NO<sub>2</sub> levels on particular road links.

Sites located in areas where it is considered possible that NO<sub>2</sub> levels might exceed the AQO will remain operational for at least one year and will then be reviewed; closing to be opened elsewhere if the levels found are not considered significant.

At the moment, several sites are located on the Twynyrodyn Road link due to the elevated NO<sub>2</sub> levels found on one section of it. These sites reveal the general trend of NO<sub>2</sub> levels along the link and will highlight deviations from the trend produced by the MTCBC's actions to reduce the NO<sub>2</sub> levels.



Figure 2.3 – Maps of Non-Automatic Monitoring Sites

Figure 2.3a – Diffusion tubes throughout Merthyr Tydfil County Borough

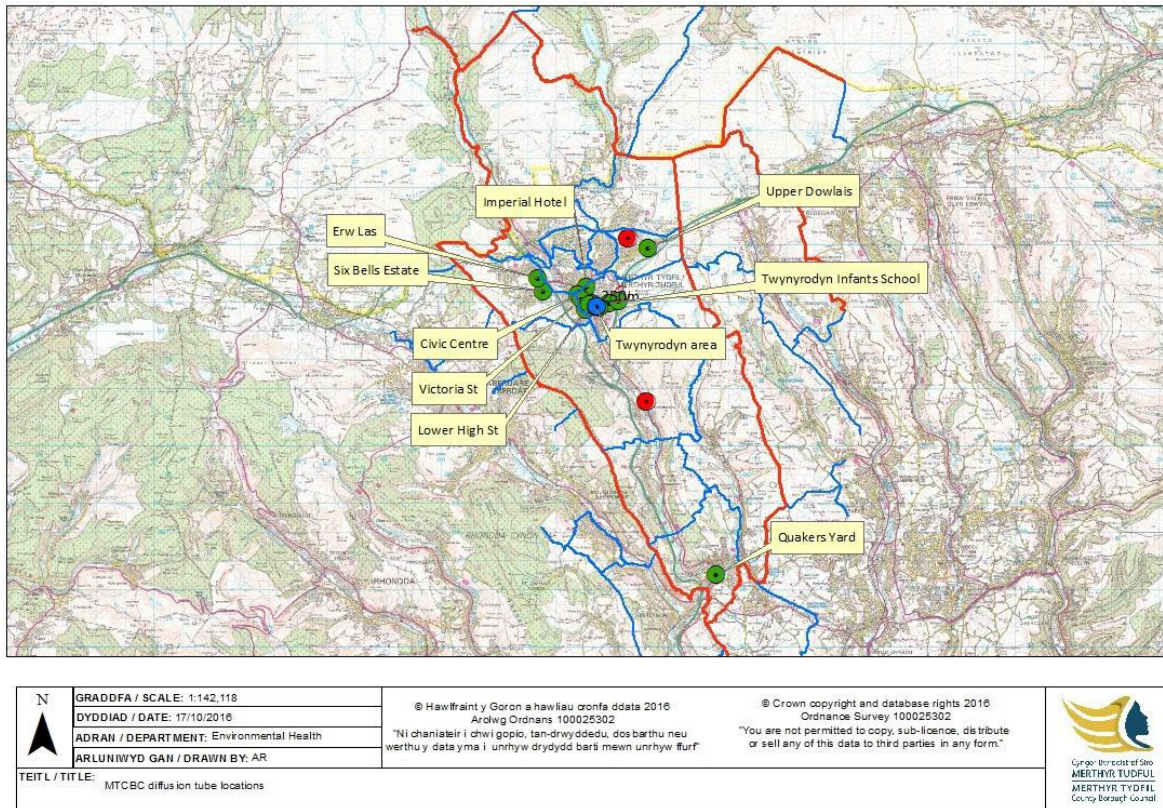


Figure 2.3b – Diffusion tubes within Merthyr Tydfil

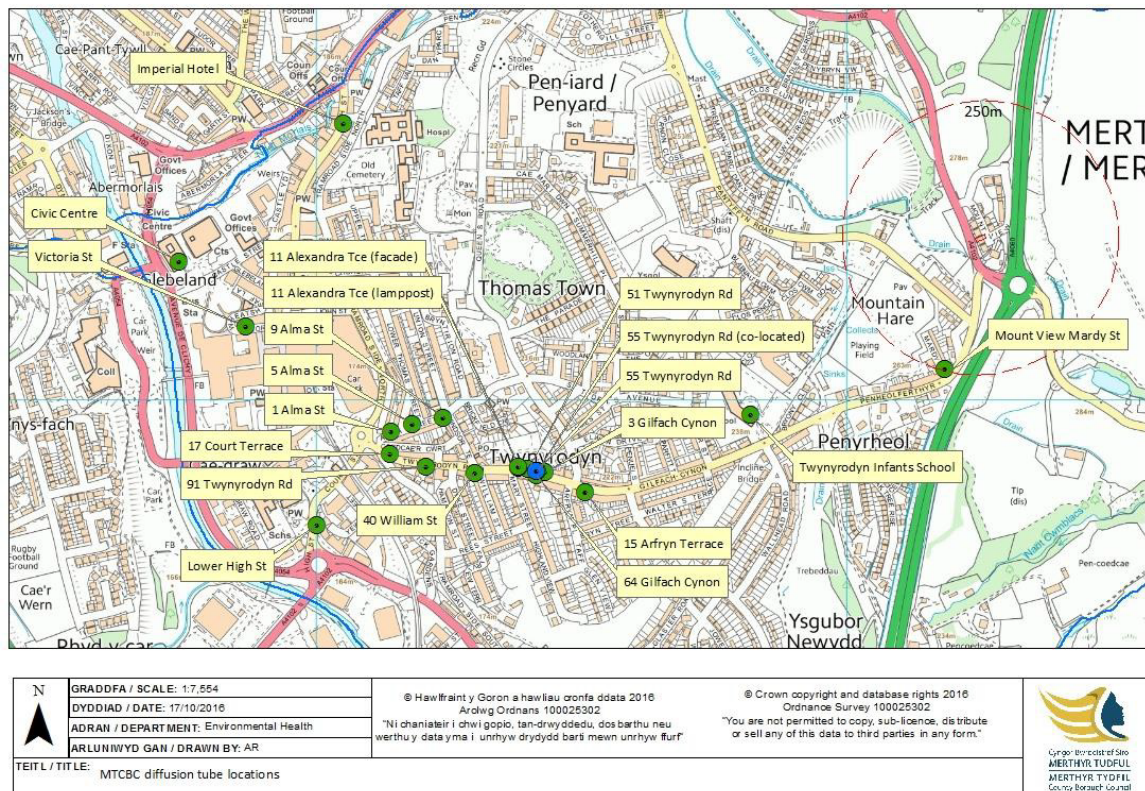
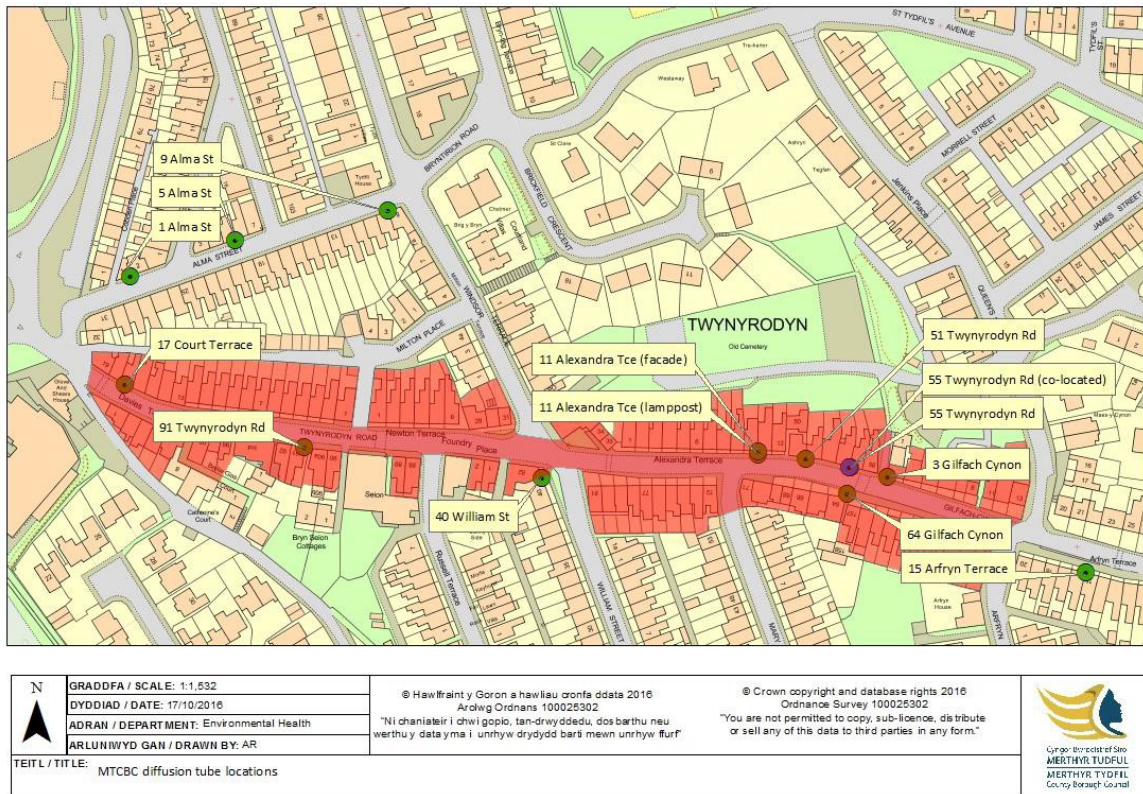




Figure 2.3c – Diffusion tubes along Twynnyrodyn Road, including the AQMA



**Table 2.2 – Details of Non- Automatic Monitoring Sites**

<b>Site ID</b>	<b>Site Name</b>	<b>Site Type</b>	<b>X OS Grid Reference</b>	<b>Y OS Grid Reference</b>	<b>Site Height (m)</b>	<b>Pollutants Monitored</b>	<b>In AQMA?</b>	<b>Is Monitoring Co-located with a Continuous Analyser (Y/N)</b>	<b>Relevant Exposure? (Y/N with distance (m) from monitoring site to relevant exposure)</b>	<b>Distance to Kerb of Nearest Road (m) (N/A if not applicable)</b>	<b>Does this Location Represent Worst-Case Exposure?</b>
1	Imperial Hotel (WAQF1)	Roadside	305044	206534	2.3	NO <sub>2</sub>	N	N	Y (2.6m)	2.3m	Y
2	Civic Centre (WAQF2)	Urban background	304743	206261	1.9	NO <sub>2</sub>	N	N	Y (135.0m)	42m	N
3	Twynyrodyn Infants School (WAQF3)	Suburban	305832	205941	2.1	NO <sub>2</sub>	N	N	Y (56.0m)	57m	N
15	Victoria Street (WAQF15)	Urban Centre	304866	206137	2.4	NO <sub>2</sub>	N	N	Y (0.15m)	2.6m	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?
16	Six Bells Estate (WAQF16)	Suburban	303525	206388	2.0	NO <sub>2</sub>	N	N	Y(0.15m)	6.6m	N
25	Upper Dowlais (WAQF25)	Roadside	307171	207915	2.3	NO <sub>2</sub>	N	N	Y (0.15m)	1.5m	Y
29	55 Twynyrodyn Road (WAQF29)	Roadside	305410	205869	2.2	NO <sub>2</sub>	Y	Y	Y (0.15m)	1.6m	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?
29J	55 Twynyrodyn Road (collocated) (29J)	Roadside	305410	205869	2.6	NO <sub>2</sub>	Y	Y	Y (0.15m)	1.6m	Y
29A	91 Twynyrodyn Road (29A)	Roadside	305217	205880	2.4	NO <sub>2</sub>	Y	N	Y (.15m)	2.2m	Y
29B	15 Arfryn Terrace (29B)	Roadside	305147	205906	2.1	NO <sub>2</sub>	Y	N	Y (0.15m)	4.85m	Y
29D	17 Court Terrace (29D)	Roadside	305149	205906	2.2	NO <sub>2</sub>	Y	N	Y (0.15m)	1.3m	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?
29E	40 William Street (29E)	Roadside	305316	205872	2.0	NO <sub>2</sub>	Y	N	Y (0.15m)	5.3m	Y
29F	Mount View Mardy Street (29F)	Roadside	305521	205836	2.1	NO <sub>2</sub>	N	N	Y (0.15m)	3.3m	Y
29G	64 Gilfach Cynon (29G)	Roadside	305415	205856	2.2	NO <sub>2</sub>	Y	N	Y (2.0m)	1.5m	Y
29H	51 Twynyrodyn Road (29H)	Roadside	305431	205863	2.2	NO <sub>2</sub>	Y	N	Y (0.15m)	1.55m	N
29I	3 Gilfach Cynon (29I)	Roadside	305431	205863	2.3	NO <sub>2</sub>	Y	N	Y (0.15m)	2.2m	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?
30	Quakers Yard (WAQF30)	Suburban	309573	196518	1.9	NO <sub>2</sub>	N	N	Y (0.15m)	4.0m	N
31	4 Erw Las (WAQF31)	Suburban	303360	206822	2.0	NO <sub>2</sub>	N	N	Y (0.15m)	37.0m	N
36	15 Lower High Street (36)	Roadside	305001	205763	2.3	NO <sub>2</sub>	N	N	Y (0.15m)	3.6m	Y
38	11 Alexandra Terrace (lamppost) (38)	Roadside	305382	205872	3.0	NO <sub>2</sub>	Y	N	Y(1.6m)	1.45m	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?
39	11 Alexandra Terrace (facade) (39)	Kerbside	305382	205873	1.5	NO <sub>2</sub>	Y	N	Y(0.15m)	2.9m	Y
44	1 Alma Street (44)	Roadside	305141	205940	2.3	NO <sub>2</sub>	N	N	Y(0.15m)	1.2m	Y
42	5 Alma Street (42)	Roadside	305181	205954	2.3	NO <sub>2</sub>	N	N	Y(0.15m)	1.3m	Y
43	9 Alma Street (43)	Roadside	305240	205965	2.3	NO <sub>2</sub>	N	N	Y(0.15m)	1.45m	Y

## **2.2 Comparison of Monitoring Results with Air Quality Objectives**

### **2.2.1 Nitrogen Dioxide (NO<sub>2</sub>)**

#### **Automatic Monitoring Data**

The ECC monitor captured 12 months, from January 2015 until December 2015. Results show NO<sub>2</sub> exceeded 40µg/m<sup>3</sup>, in agreement with the findings from the diffusion tubes. The ECC gave some negative readings for NO<sub>2</sub>. This is as the sensor responding to ozone scouring, and as a consequence it may under-read, as shown in Figure 2.4. Screening the data to remove negative concentrations does improve this, however it is a crude method of filtering the data. Overall both total data and data screened to remove negative values are within 10% of the annual mean for the diffusion tubes, and as such there is a reasonable correlation between both methods. The ECC is located within the AQMA.

**Table 2.3 – Results of Automatic Monitoring for NO<sub>2</sub>: Comparison with Annual Mean Objective**

Site ID	Site Type	Within AQMA?	Valid Data Capture for Monitoring Period % <sup>a</sup>	Valid Data Capture 2015 % <sup>b</sup>	Annual Mean Concentration (µg/m <sup>3</sup> )				
					2011* <sup>c</sup>	2012* <sup>c</sup>	2013* <sup>c</sup>	2014* <sup>c</sup>	2015 <sup>c</sup>
ECC	Roadside	Y	100%	100				<b>52.3 (158.4)</b>	<b>41.5</b>
ECC (screened)	Roadside	Y	92%	92					<b>46.1</b>

**In bold**, exceedence of the NO<sub>2</sub> annual mean AQS objective of 40µg/m<sup>3</sup>

<sup>a</sup> i.e. data capture for the monitoring period, in cases where monitoring was only carried out for part of the year

<sup>b</sup> 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%)

<sup>c</sup> 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

ECC screened is the same device. Negative results have been removed as a crude data filtering technique, removing results that are inherently false. However no correction factor for the effect of ozone has been applied to other results.

**Table 2.4 – Results of Automatic Monitoring for NO<sub>2</sub>: Comparison with 1-hour Mean Objective**

Site ID	Site Type	Within AQMA?	Valid Data Capture for Monitoring Period % <sup>a</sup>	Valid Data Capture 2015 % <sup>b</sup>	Number of Hourly Means > 200µg/m <sup>3</sup>				
					2011* <sup>c</sup>	2012* <sup>c</sup>	2013* <sup>c</sup>	2014* <sup>c</sup>	2015 <sup>c</sup>
ECC	Roadside	Y	100	100				1	0

**In bold**, exceedence of the NO<sub>2</sub> hourly mean AQS objective (200µg/m<sup>3</sup> – not to be exceeded more than 18 times per year)

<sup>a</sup> i.e. data capture for the monitoring period, in cases where monitoring was only carried out for part of the year

<sup>b</sup> 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%)

<sup>c</sup> If the data capture for full calendar year is less than 85%, include the 99.8<sup>th</sup> percentile of hourly means in brackets

\* Number of exceedences for previous years is optional



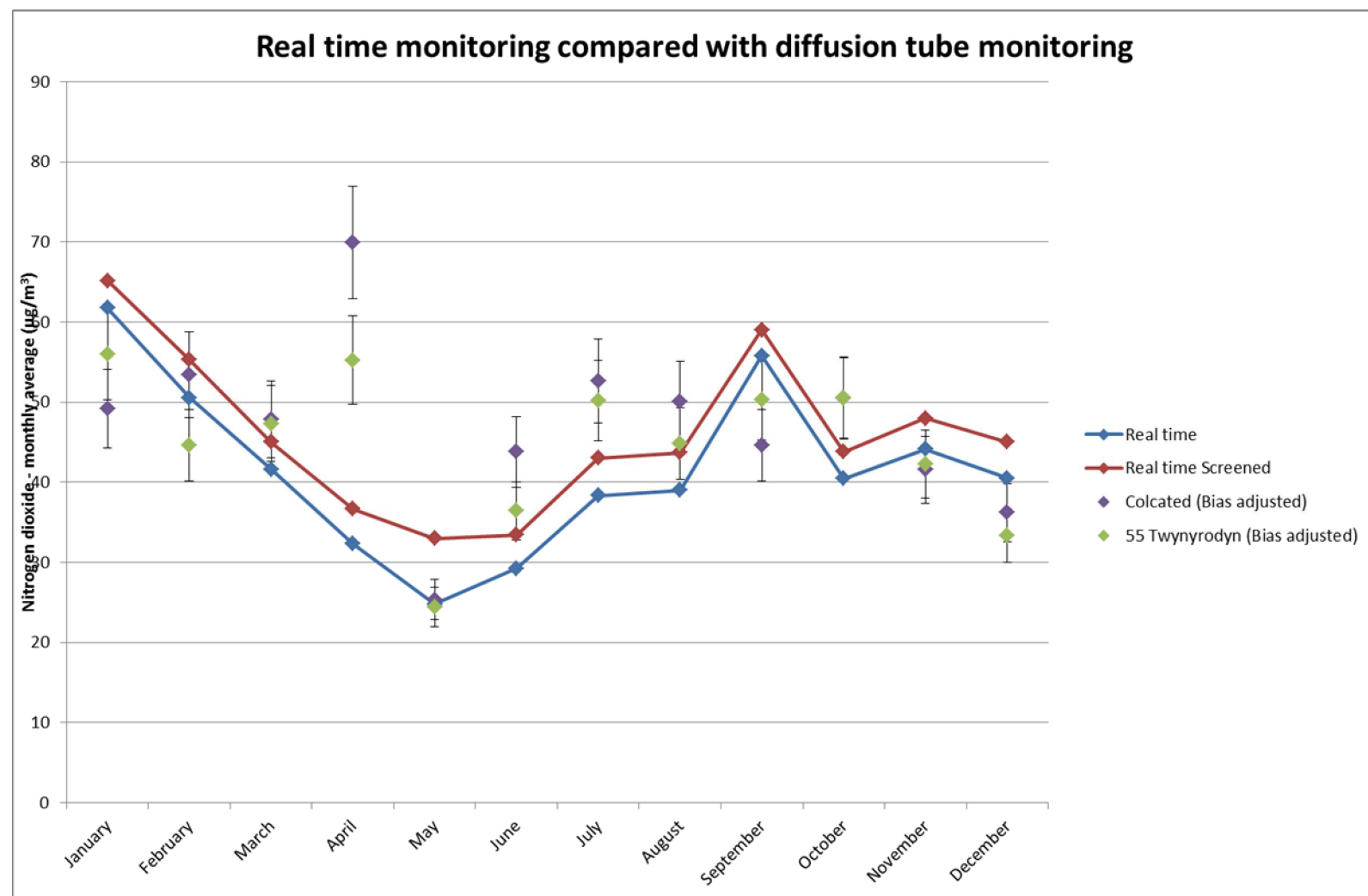
Figure 2.4 – Comparison of monthly NO<sub>2</sub> monitoring with the ECC and collocated diffusion tubes

Figure 2.5 – A graph to show the influence of ozone on nitrogen dioxide detected by the ECC

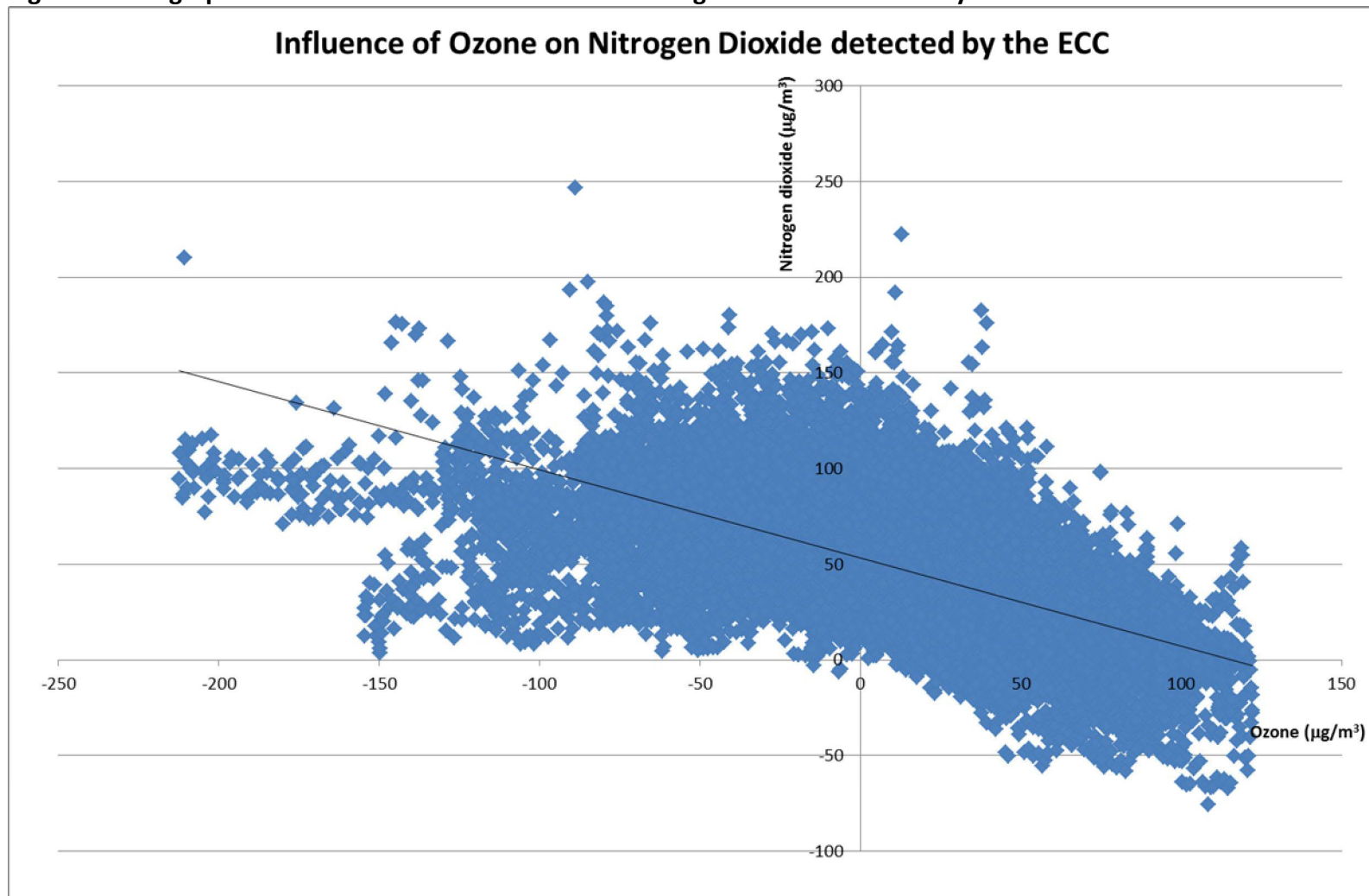


Table 2.3 shows the AQO is being exceeded as detected by the ECC. It is within the AQMA. When results of the diffusion tubes and ECC stabilise below  $36\mu\text{g}/\text{m}^3$  it may be possible to consider revoking or amending the AQMA. Results show a reduction since 2014, however 2014 was based on a period mean, and as such is less reliable than an annual mean derived from 12 months of data. The difference may be less significant than the figures imply.

Figure 2.4 shows the ECC monitor is usually within 10% of the diffusion tubes. This is a reasonable correlation. As a non-standardised method it is being used for indicative real time measurements only. Any decision to revoke the AQMA will not be based on ECC monitoring in isolation, but on both ECC and diffusion tube measurements stabilising at a level below  $36\mu\text{g}/\text{m}^3$ .

Figure 2.5 shows high ozone concentrations result in negative  $\text{NO}_2$  readings, and high  $\text{NO}_2$  concentrations result in negative ozone readings. Both probes in place in 2015 were subject to interference from other gases. Most importantly for monitoring an  $\text{NO}_2$  exceedence, the  $\text{NO}_2$  probe was affected by ozone scouring. Although a linear trendline has been provided this is for illustrative purposes only and a linear relationship cannot be assumed. The manufacturer incorporated an algorithm to minimise the effects, however it has limitations. On the basis of this ozone effect, the recorded  $\text{NO}_2$  concentrations may be an underestimate of the true  $\text{NO}_2$  concentration.

In late 2016 the monitor went through maintenance, which included the provision of upgraded sensors. The upgraded  $\text{NO}_2$  sensor is less affected by ozone, and as such it will give a higher level of accuracy to figures for 2017.

The daily variations in  $\text{NO}_2$  are not considered in detail in this report. They were considered in the detailed assessment (MTCBC, 2015). They were found to relate to diurnal traffic flow, in particular high levels of  $\text{NO}_2$  associated with traffic moving away from town during the evening rush-hour.

### **Diffusion Tube Monitoring Data**

Diffusion tube data for 2015 is summarised in Table 2.5, and annual trends in Table 2.6 and the associated figures. There are exceedences of the limit of  $40\mu\text{g}/\text{m}^3$ , specifically in the area around 55 Twynyrodyn Road. Exceedences were detected at 55 Twynyrodyn Road, 51 Twynyrodyn Road and 11 Alexandra Terrace (lamp-post). The results at 3 Gilfach Cynon and 11 Alexandra Terrace (façade) are within 10% of the AQO. Given the inaccuracies of diffusion tubes this may indicate breaches. All these tubes are within the AQMA.

**Table 2.5 – Results of NO<sub>2</sub> Diffusion Tubes 2015**

Site ID	Location	Site Type	Within AQMA?	Triplicate or Co-located Tube	Full Calendar Year Data Capture 2015 (Number of Months or %) <sup>a</sup>	2015 Annual Mean Concentration (µg/m <sup>3</sup> ) - Bias Adjustment factor = 0.79 <sup>b</sup>
WAQF1	Imperial Hotel	Roadside	N	No	12	23.2
WAQF2	Civic Centre	Urban background	N	No	12	16.4
WAQF3	Twynnyroddyn Infants School	Suburban	N	No	12	12.5
WAQF15	Victoria Street	Urban Centre	N	No	12	23.6
WAQF16	Six Bells Estate	Suburban	N	No	12	10.8
WAQF25	Upper Dowlais	Roadside	N	No	12	25.3
WAQF29	55 Twynnyroddyn Road	Roadside	Y	Collocated	12	<b>44.6</b>
29J	55 Twynnyroddyn Road (collocated)	Roadside	Y	Collocated	12	<b>47.1</b>
29A	91 Twynnyroddyn Road	Roadside	Y	No	11	28.5

Site ID	Location	Site Type	Within AQMA?	Triplicate or Co-located Tube	Full Calendar Year Data Capture 2015 (Number of Months or %) <sup>a</sup>	2015 Annual Mean Concentration ( $\mu\text{g}/\text{m}^3$ ) - Bias Adjustment factor = 0.79 <sup>b</sup>
29B	15 Arfryn Terrace	Roadside	Y	No	12	33.4
29D	17 Court Terrace	Roadside	Y	No	12	29.6
29E	40 William Street	Roadside	Y	No	12	22.2
29F	Mount View Mardy Street	Roadside	N	No	12	21.0
29G	64 Gilfach Cynon	Roadside	Y	No	11	23.5
29H	51 Twynyrodyn Road	Roadside	Y	No	12	<b>45.1</b>
29I	3 Gilfach Cynon	Roadside	Y	No	12	38.0
WAQF30	Quakers Yard	Suburban	N	No	12	12.9
WAQF31	4 Erw Las	Suburban	N	No	12	11.9
36	15 Lower High Street	Roadside	N	No	12	26.5
38	11 Alexandra Terrace (lamppost)	Roadside	Y	No	12	<b>42.5</b>
39	11 Alexandra Terrace (façade)	Kerbside	Y	No	12	36.7

Site ID	Location	Site Type	Within AQMA?	Triplicate or Co-located Tube	Full Calendar Year Data Capture 2015 (Number of Months or %) <sup>a</sup>	2015 Annual Mean Concentration ( $\mu\text{g}/\text{m}^3$ ) - Bias Adjustment factor = 0.79 <sup>b</sup>
44	1 Alma Street	Roadside	N	No	11	19.7
42	5 Alma Street	Roadside	N	No	12	16.3
43	9 Alma Street	Roadside	N	No	12	17.7

**In bold**, exceedence of the NO<sub>2</sub> annual mean AQS objective of 40 $\mu\text{g}/\text{m}^3$

Underlined, annual mean > 60 $\mu\text{g}/\text{m}^3$ , indicating a potential exceedence of the NO<sub>2</sub> hourly mean AQS objective

<sup>a</sup> 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%

<sup>b</sup> If an exceedence is measured at a monitoring site not representative of public exposure, NO<sub>2</sub> concentration at the nearest relevant exposure should be estimated based on the “[NO<sub>2</sub> fall-off with distance](http://laqm.defra.gov.uk/tools-monitoring-data/no2-falloff.html)” 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 2.6 – Results of NO<sub>2</sub> Diffusion Tubes (2011 to 2015)

Site ID	Location	Site Type	Within AQMA?	Annual Mean Concentration (µg/m <sup>3</sup> ) - Adjusted for Bias <sup>a</sup>				
				2011 (Bias Adjustment Factor = 0.82)	2012 (Bias Adjustment Factor = 0.69)	2013 (Bias Adjustment Factor = 0.85)	2014 (Bias Adjustment Factor = 0.81)	2015 (Bias Adjustment Factor = 0.79)
WAQF1	Imperial Hotel	Roadside	N	27.1	24.1	26.3	23.1	23.2
WAQF2	Civic Centre	Urban background	N	22.1	16.7	21.8	19.4	16.4
WAQF3	Twynyrodyn Infants School	Suburban	N	13.8	11.2	13.9	12.4	12.5
WAQF15	Victoria Street	Urban Centre	N	23.6	20.9	26.2	24.3	23.6
WAQF16	Six Bells Estate	Suburban	N	13.2	10.8	13.4	11.4	10.8
WAQF25	Upper Dowlais	Roadside	N	24.8	22.7	28.7	26.1	25.3
WAQF29	55 Twynyrodyn Road	Roadside	Y	<b>52.0</b>	<b>41.9</b>	<b>49.8</b>	<b>45.7</b>	<b>44.6</b>
29J	55 Twynyrodyn Road (collocated)	Roadside	Y			<b>57.0</b>	<b>47.5</b>	<b>47.1</b>
29A	91 Twynyrodyn Road	Roadside	Y	35.0	29.2	32.6	29.1	28.5



Site ID	Location	Site Type	Within AQMA?	Annual Mean Concentration ( $\mu\text{g}/\text{m}^3$ ) - Adjusted for Bias <sup>a</sup>				
				2011 (Bias Adjustment Factor = 0.82)	2012 (Bias Adjustment Factor = 0.69)	2013 (Bias Adjustment Factor = 0.85)	2014 (Bias Adjustment Factor = 0.81)	2015 (Bias Adjustment Factor = 0.79)
29B	15 Arfryn Terrace	Roadside	Y	23.0	28.0	33.1	33.4	33.4
29D	17 Court Terrace	Roadside	Y	21.1	28.4	31.2	30.6	29.6
29E	40 William Street	Roadside	Y	32.6	21.7	24.7	22.2	22.2
29F	Mardy Street Mount View	Roadside	N	22.6	18.7	22.9	22.3	21.0
29G	64 Gilfach Cynon	Roadside	Y	27.1	22.5	26.0	23.1	23.5
29H	51 Twynyrodyn Road	Roadside	Y		<b>41.3</b>	<b>51.1</b>	<b>45.9</b>	<b>45.1</b>
29I	3 Gilfach Cynon	Roadside	Y		34.7	38.0	36.5	38.0
WAQF30	Quakers Yard	Suburban	N	13.7	11.3	13.9	12.8	12.9
WAQF31	4 Erw Las	Suburban	N	12.7	11.5	14.0	11.5	11.9
36	15 Lower High Street	Roadside	N		38.2	32.8	28.7	26.5
38	11 Alexandra Terrace (lamppost)	Roadside	Y			<b>54.8</b>	<b>43.3</b>	<b>42.5</b>

Site ID	Location	Site Type	Within AQMA?	Annual Mean Concentration ( $\mu\text{g}/\text{m}^3$ ) - Adjusted for Bias <sup>a</sup>				
				2011 (Bias Adjustment Factor = 0.82)	2012 (Bias Adjustment Factor = 0.69)	2013 (Bias Adjustment Factor = 0.85)	2014 (Bias Adjustment Factor = 0.81)	2015 (Bias Adjustment Factor = 0.79)
39	11 Alexandra Terrace (façade)	Kerbside	Y			<b>49.0</b>	35.4	36.7
44	1 Alma Street	Roadside	N		19.0	23.4	19.7	19.7
42	5 Alma Street	Roadside	N		24.4	19.7	17.1	16.3
43	9 Alma Street	Roadside	N		15.4	20.4	17.8	17.7

**In bold**, exceedence of the NO<sub>2</sub> annual mean AQS objective of 40 $\mu\text{g}/\text{m}^3$

Underlined, annual mean > 60 $\mu\text{g}/\text{m}^3$ , indicating a potential exceedence of the NO<sub>2</sub> hourly mean AQS objective

<sup>a</sup> 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 2.6 – Trends in Annual Mean Nitrogen Dioxide Concentrations Measured at Diffusion Tube Monitoring Sites

Figure 2.6a – Trends at all sites within Merthyr Tydfil County Borough

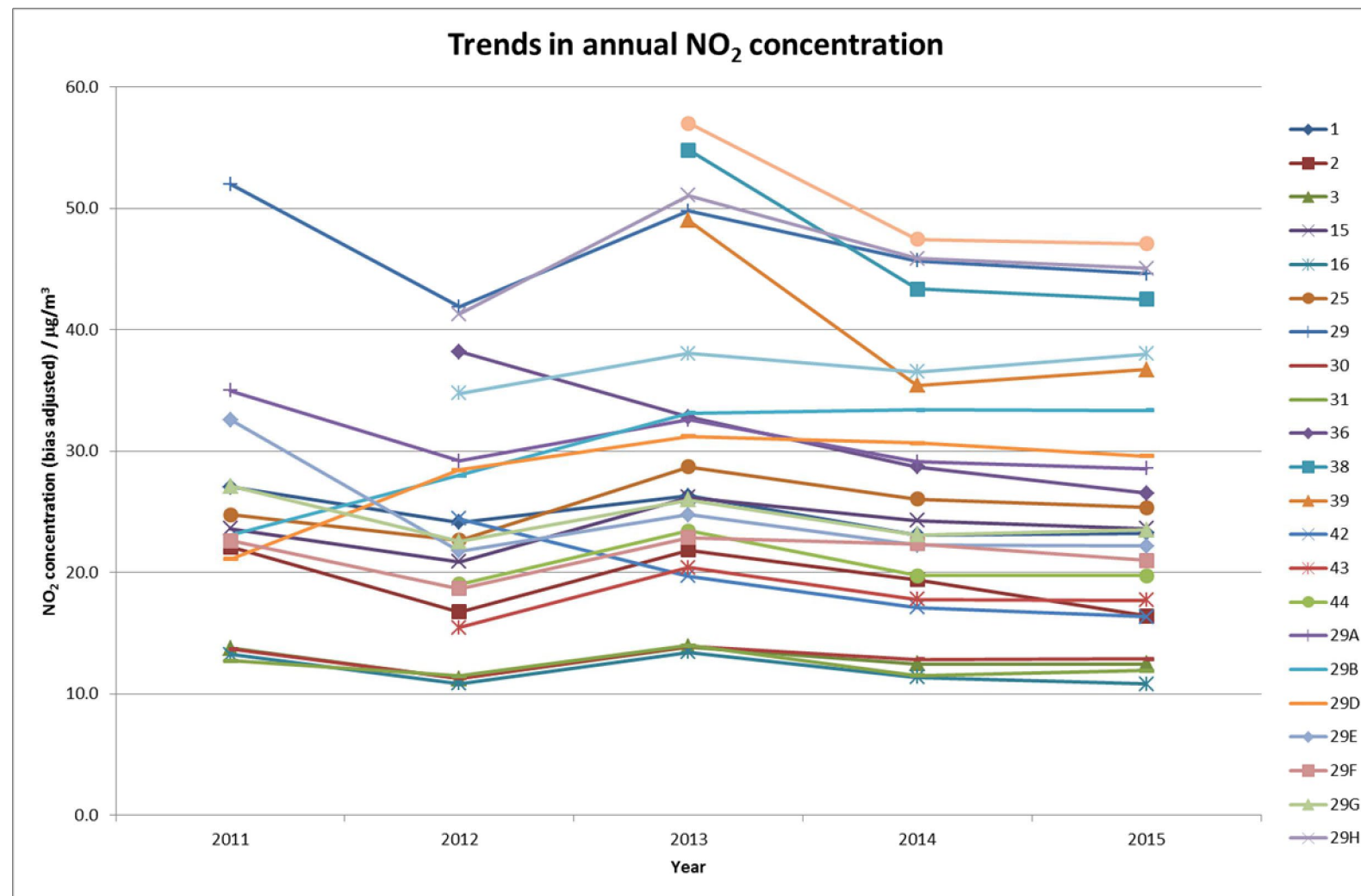


Figure 2.6b – Trends at sites outside the Twynyrodyn Road area

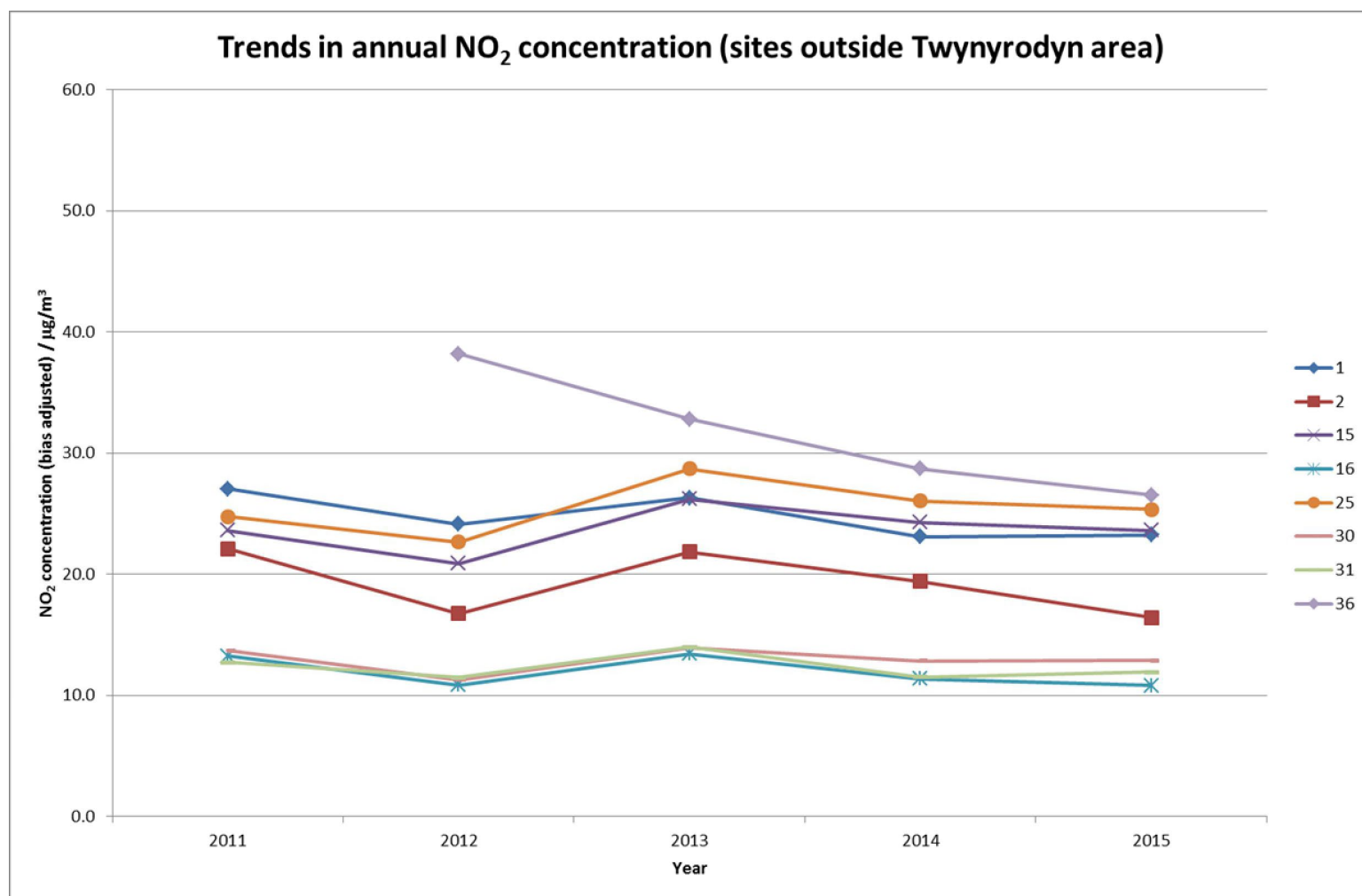


Figure 2.6c – Trends at sites within the Twynyrodyn Road area

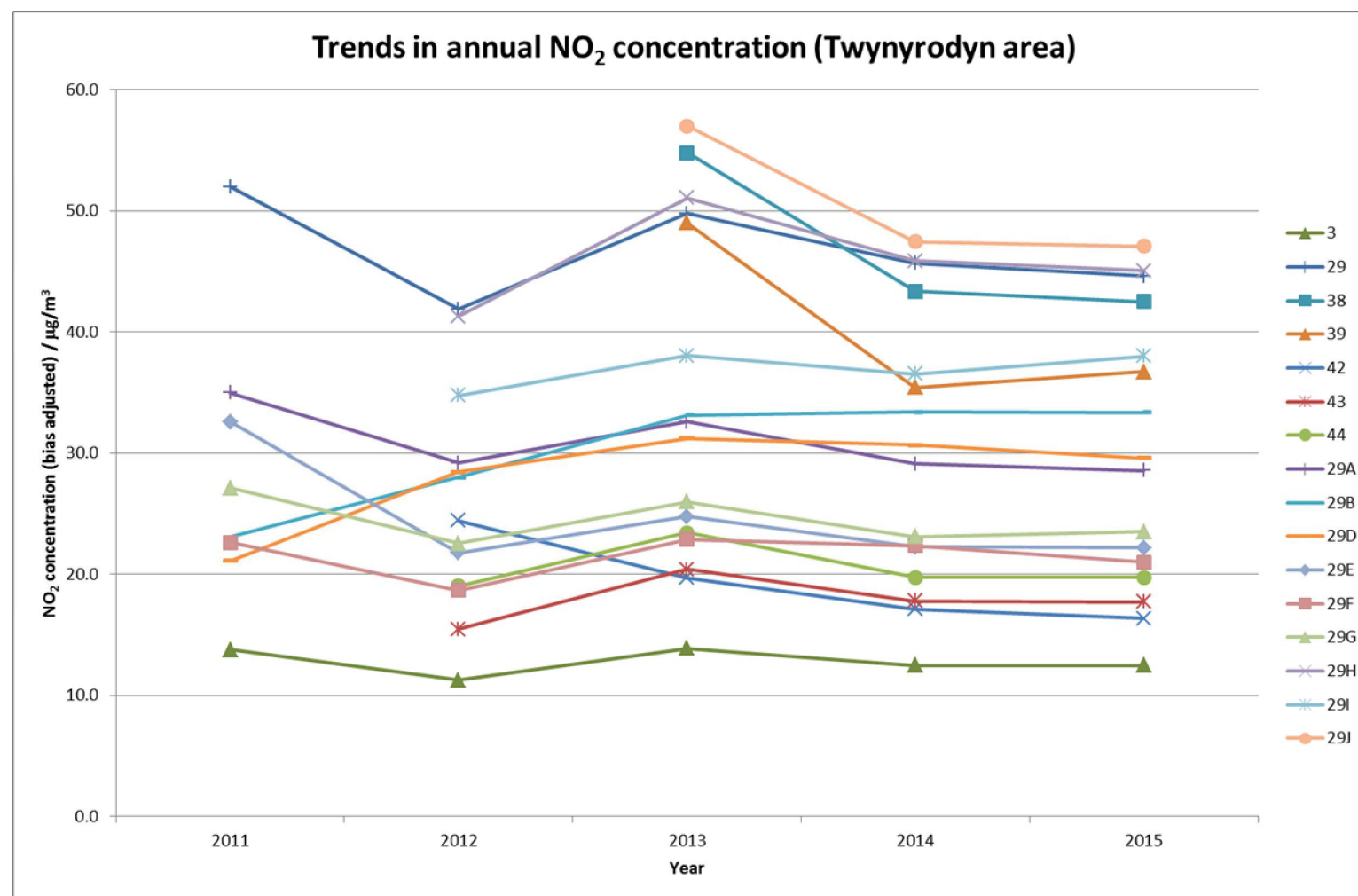


Figure 2.6d – Trends at sites within the Twynyrodyn Road AQMA

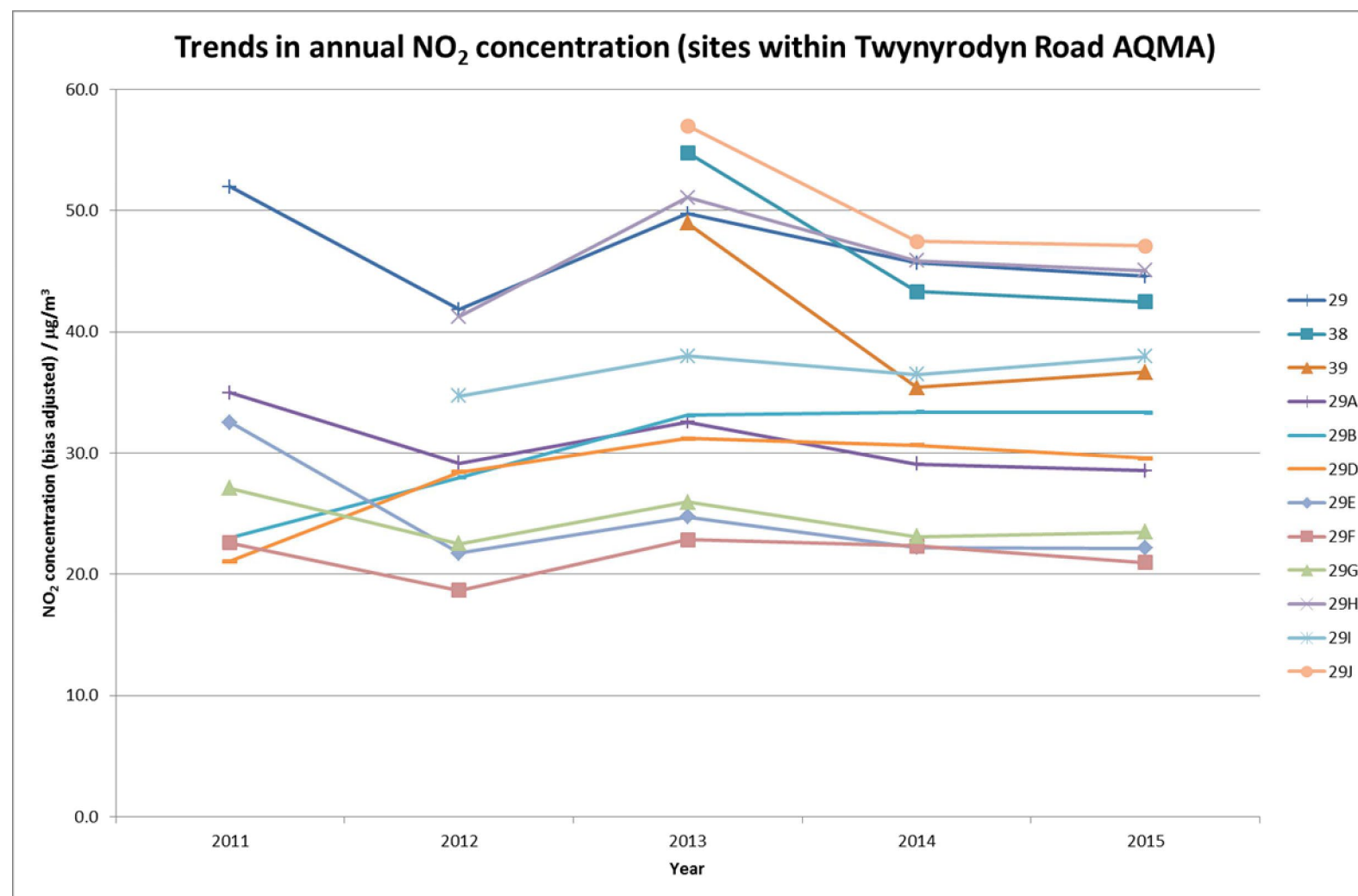


Table 2.6 shows an exceedence of the air quality standard for annual NO<sub>2</sub>, 40µg/m<sup>3</sup> at 4 sites, namely 55 Twynrodyn Road (collocated tubes), 51 Twynrodyn Road, and 11 Alexandra Terrace (lamp-post). The 4 sites are in close proximity to each other, and are within the AQMA. The annual NO<sub>2</sub> at 3 Gilfach Cynon and at 11 Alexandra Terrace (façade) are also close to (within 10% of) the air quality standard. They are also located within the AQMA. With the levels of inaccuracy associated with diffusion tubes the boundary of the area of exceedence may be further East within the Twynyrodyn Road AQMA than previously considered.

In 2013 Merthyr Tydfil underwent significant roadworks. New one way systems were introduced along Tramroadside North, which Twynyrodyn Road connects to, and along Avenue de Clichy creating a new gyratory, the River Taff Central Link. Additionally there were roadworks along the A470 including works to the Cyfarthfa Retail Park junction. The roadworks were completed in Autumn 2014. During the roadworks traffic flow throughout the borough was disrupted, and air quality throughout the borough deteriorated with the worst results in the previous 5 years seen in 2013. It is worth noting that although NO<sub>2</sub> concentrations reduced from 2013 to 2014 and have stayed at a similar level in 2015, a number of tubes have settled at NO<sub>2</sub> concentrations above the 2012 level, including those around 55 Twynyrodyn Road settling above the AQO. As this has been seen for 2 years in succession it indicates that the alterations to traffic flow have had on ongoing negative effect on air quality.

Results from 2014 and 2015 show NO<sub>2</sub> concentrations at all sites along Twynyrodyn Road have decreased or stayed approximately the same compared to 2013, however any decrease has not been sufficient for the air quality standard to be met in the area around 55 Twynyrodyn Road. This shows although there are some traffic calming measures in place further works are needed to meet the air quality standard. Following a detailed assessment, on 30<sup>th</sup> January 2017 an AQMA was declared. The associated action plan will be produced with the aim of it achieving suitable improvements. As the cause of the exceedence is relatively heavy traffic on an enclosed road with properties close to the kerbside, the action plan will initially focus on measures to ease traffic flow and to encourage drivers to seek alternative routes.

No annual mean NO<sub>2</sub> concentrations have exceeded 60µg/m<sup>3</sup> and there is no indication the 1-hour mean objective was likely to have been frequently exceeded. This is in line with findings from the ECC monitor, which recorded one concentration above 200µg/m<sup>3</sup> (202µg/m<sup>3</sup>).



### **2.2.2 Particulate Matter (PM<sub>10</sub>)**

The Tables below demonstrate continuing and consistent compliance with the relevant AQO. The site operators, Miller Argent (South Wales) Ltd., provide gravimetric equivalent data for PM<sub>10</sub> and TEOM data for PM<sub>2.5</sub> on the Welsh Air Quality Forum. Only PM<sub>10</sub> is considered in this report.

**Table 2.7 – Results of Automatic Monitoring for PM<sub>10</sub>: Comparison with Annual Mean Objective**

Site ID	Site Type	Within AQMA?	Valid Data Capture for Monitoring Period % <sup>a</sup>	Valid Data Capture 2015 % <sup>b</sup>	Confirm Gravimetric Equivalent (Y or N/A)	Annual Mean Concentration (µg/m <sup>3</sup> )				
						2011* <sup>c</sup>	2012* <sup>c</sup>	2013* <sup>c</sup>	2014* <sup>c</sup>	2015 <sup>c</sup>
APM1 Twynyrodyn School	Suburban	Y	95	95	Y	16.0	13.3	13.0	9.63	9.26

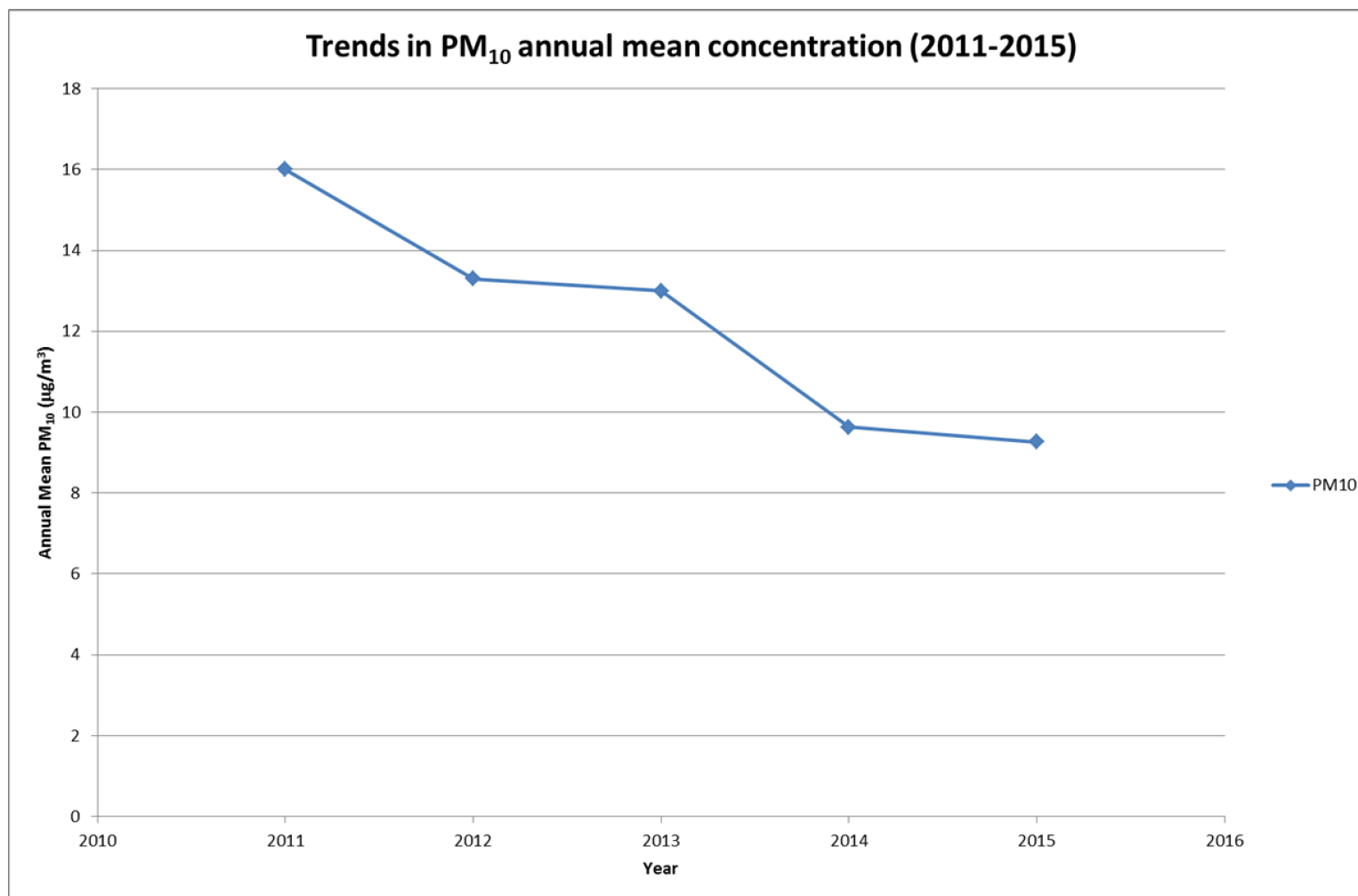
**In bold**, exceedence of the PM<sub>10</sub> annual mean AQS objective of 40µg/m<sup>3</sup>

<sup>a</sup> i.e. data capture for the monitoring period, in cases where monitoring was only carried out for part of the year

<sup>b</sup> 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%)

<sup>c</sup> 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 2.7 – Trends in Annual Mean PM<sub>10</sub> Concentrations

**Table 2.8 – Results of Automatic Monitoring for PM<sub>10</sub>: Comparison with 24-hour Mean Objective**

Site ID	Site Type	Within AQMA?	Valid Data Capture for Monitoring Period % <sup>a</sup>	Valid Data Capture 2015 % <sup>b</sup>	Confirm Gravimetric Equivalent (Y or N/A)	Number of Daily Means > 50µg/m <sup>3</sup>				
						2011* <sup>c</sup>	2012* <sup>c</sup>	2013* <sup>c</sup>	2014* <sup>c</sup>	2015 <sup>c</sup>
APM1 Twynyrodyn School	Suburban	Y	95	95	Y	8	2	0	0	0

**In bold**, exceedence of the PM<sub>10</sub> daily mean AQS objective (50µg/m<sup>3</sup> – not to be exceeded more than 35 times per year)

<sup>a</sup> i.e. data capture for the monitoring period, in cases where monitoring was only carried out for part of the year

<sup>b</sup> 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%)

<sup>c</sup> if data capture for full calendar year is less than 85%, include the 90.4<sup>th</sup> percentile of 24-hour means in brackets

\* Number of exceedences for previous years is optional

Figure 2.8 – Exceedences of 24-hour mean PM<sub>10</sub> AQO (2011-2015)

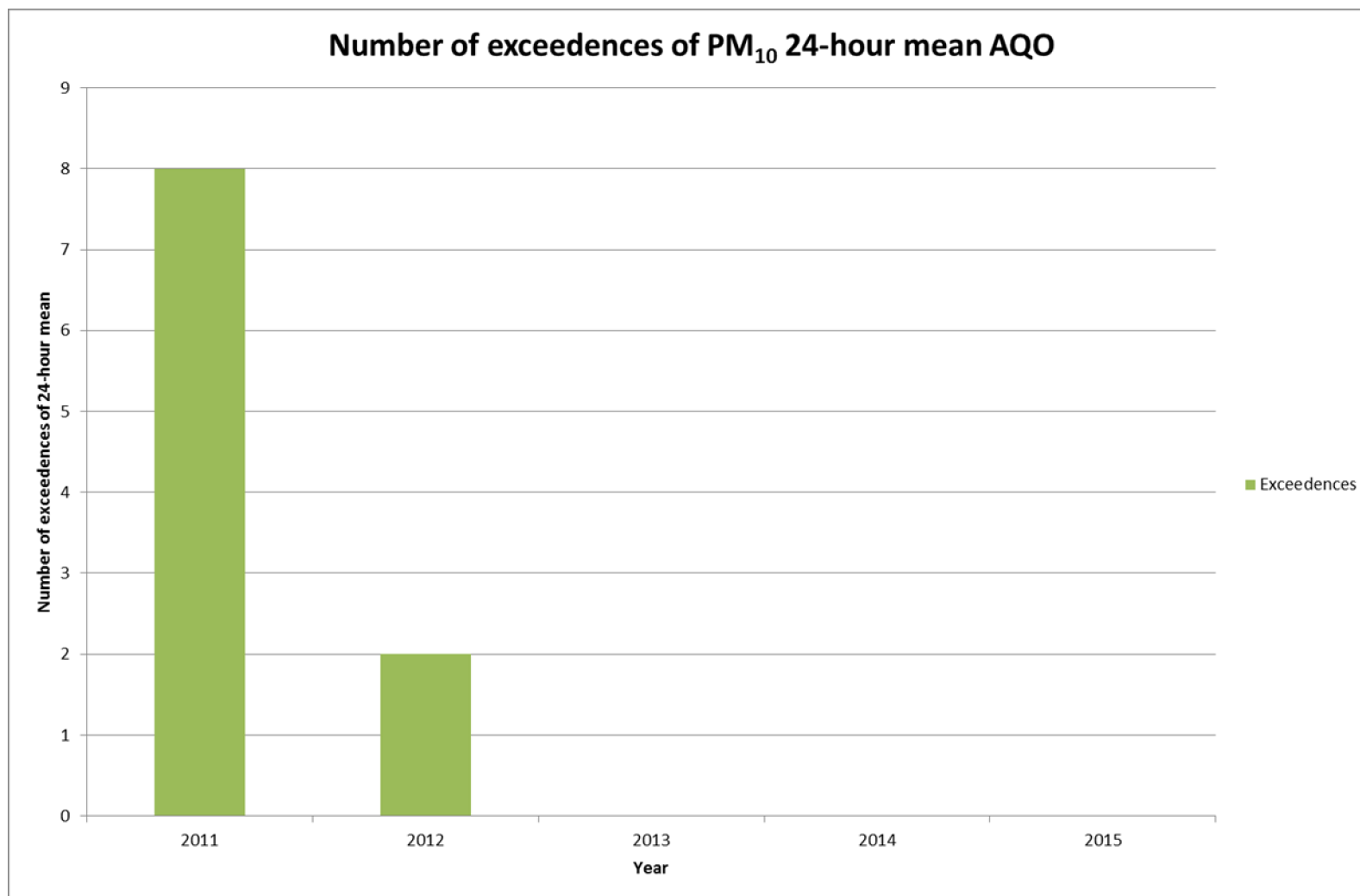


Table 2.7 and Figure 2.5 show PM<sub>10</sub> has consistently stayed below the air quality standard of 40µg/m<sup>3</sup> annual mean. Table 2.8 and Figure 2.6 show there have been a reducing number of exceedences of 50µg/m<sup>3</sup> 24-hour mean. PM<sub>10</sub> is not considered to pose a problem within Merthyr Tydfil.

### **2.2.3 Sulphur Dioxide (SO<sub>2</sub>)**

Merthyr Tydfil County Borough Council does not carry out sulphur dioxide monitoring.

### **2.2.4 Benzene**

Merthyr Tydfil County Borough Council does not carry out benzene monitoring.

### **2.2.5 Other Pollutants Monitored**

Merthyr Tydfil County Borough Council does not carry out monitoring of other pollutants.

### **2.2.6 Summary of Compliance with AQS Objectives**

MTCBC has examined the results from monitoring in the Merthyr Tydfil County Borough.

Concentrations within the AQMA still exceed the annual mean air quality objective of 40µg/m<sup>3</sup> for NO<sub>2</sub> at the area around 55 Twynnyroddyn Road and the AQMA should remain.

An action plan will be produced and implemented, and ongoing diffusion tube and real time monitoring will be used to assess its success. Further assessments will be produced on a periodic basis.

Concentrations outside of the AQMA are all below the objectives at relevant locations, therefore there is no need to proceed to a Detailed Assessment.

## **3 New Local Developments**

### **3.1 Road Traffic Sources**

#### **Narrow Congested Streets with Residential Properties Close to the Kerb**

##### **Twynyrodyn Road**

As identified in previous reports and the Detailed Assessment 2015, Twynyrodyn Road is a narrow, busy street with residential properties close to the kerb. Around the area of 55 Twynyrodyn Road there have been breaches of the AQO for NO<sub>2</sub>. This has been confirmed through extensive monitoring with diffusion tubes and a real time ECC monitor.

Following the Detailed Assessment MTCBC declared an AQMA on 30<sup>th</sup> January 2017, and will produce and implement an air quality action plan with a view to improving air quality within the AQMA. The aim of the action plan is to reduce traffic volumes and improve traffic flows thereby improving air quality. It will be through a range of traffic calming measures.

#### **Roads with significantly changed traffic flows**

##### **Trago Mills Development, Swansea Road**

Construction has commenced on the Trago Mills development, Swansea Road. This site was granted planning permission in 2003, however site clearance and remediation has taken a number of years. The development is a £40 million 30,250m<sup>2</sup> retail development and will include 38 retail departments, leisure facilities and a petrol station.

The development is not expected to open until 2018. During 2017 MTCBC intend to open a new diffusion tube location on Swansea Road to gather information on background levels. This will remain open once the retail development opens in order to assess its impact on air quality.

It is anticipated to have a negative effect on air quality. In Devon the area around the Trago Mills island, Newton Abbot, is frequently congested and as a consequence road widening is taking place in the area. It has not been possible to find out how much of this congestion is



directly linked to Trago Mills itself. Other Trago Mills developments in the South West of England have also been referred to in relation to congestion. Given the Trago Mills development in Merthyr will be in close proximity to Cyfarthfa Retail Park and the A470, there is a significant risk congestion may occur. The nearest residential development is Tai Mawr Road, at the East end of Swansea Road. It is difficult to estimate the impact due to the lack of comparable developments in South Wales.

### **3.2 Other Transport Sources**

There are no other transport sources identified since the previous Updating and Screening Assessment.

### **3.3 Industrial Sources**

There are no other industrial sources identified since the previous Updating and Screening Assessment.

### **3.4 Commercial and Domestic Sources**

There are no other commercial or domestic sources identified since the previous Updating and Screening Assessment.

### **3.5 New Developments with Fugitive or Uncontrolled Sources**

There are no new development with fugitive or uncontrolled sources identified since the previous Updating and Screening Assessment.

MTCBC has identified the following new or previously unidentified local developments which may impact on air quality in the Local Authority area.

- Twynyrodyn Road AQMA
- Trago Mills Development

These will be taken into consideration in the next Updating and Screening Assessment.

Twynyrodyn Road will also be assessed in annual further assessments following the declaration of the AQMA.

## 4 Planning Applications

### **Merthyr Tydfil New Bus Station**

MTCBC have planning approval to develop a new bus station. This will relocate the current bus station from Glebeland Street to a new bus station on the location of the Former Hollies Health Centre and Former Police Station, Swan Street, both of which have been demolished.

As part of the planning application the Environmental Health Department required the applicant to carry out air quality modelling for the proposed bus station. The Air Quality report for the development predicted air quality within AQOs. This will need monitoring as there was a limited amount of monitoring data used in preparing the report, specifically although 6 months data was obtained this did not include at least 3 months of winter data.

A service level agreement has been put in place between the Environmental Health Department and Town Centre Management that when the proposed bus station is brought into use diffusion tube monitoring will take place at nearby residential and commercial areas to determine whether the NO<sub>2</sub> levels predicted in the air quality assessment are being achieved.

At this time the Environmental Health Department will not be carrying out a detailed assessment, as modelling has been addressed as part of the planning process.

MTCBC has assessed the proposed bus station, and concluded that it will not be necessary to proceed to a Detailed Assessment.

## **5 Air Quality Planning Policies**

The Well-being of Future Generations (Wales) Act 2015 requires local authorities to improve parameters including environmental well-being. This means there is a statutory requirement to improve air quality, both within and outside AQMAs.

In Merthyr Tydfil there is no specific planning policy for air quality, however the Local Development Plan requires protection and enhancement of the environment. To this end the Environmental Health Department, as a statutory consultee, takes the impact of proposed developments on the environment including air quality into consideration. Where a deterioration in air quality is considered possible, as part of the planning process the Environmental Health Department requires an air quality assessment. Any development that is likely to result in a breach of the air quality standards would be objected to. Planning conditions that maintain the current air quality are recommended to Development Control as necessary.

## **6 Local Transport Plans and Strategies**

Road transport is responsible for the majority of air quality problems, both nationally and within Merthyr Tydfil County Borough.

Along with other local authorities in South East Wales, Merthyr Tydfil is part of SEWTA, who have developed a regional transport plan. It prioritises the development of improved public transport and sustainable transport. By encouraging moves away from private cars there should be an improvement in air quality.

The Local Development Plan includes strategic objectives for development to be within easy access of public transport, with the aim it will make car ownership and use seem less of a necessity for residents of new developments.

At a local level MTCBC charges for car parking through Pay and Display within its car parks, permits for long term users, and residents' and visitors' permits for specific streets. There is a balancing act between encouraging use of public transport and the importance of car parking to revenue generation for the Authority, and the charges are set accordingly. They are at a level where they would be perceived as reasonable by the majority of drivers.

MTCBC is a major employer within the area. To encourage its own employees to use sustainable transport, it offers a Cycle to Work Scheme. Employees can pay a subsidy from their monthly salary before tax towards the cost of a bicycle.

The action plan for the Twynnyrobyn Road AQMA will focus on a variety of traffic calming measures to encourage people to look for alternate routes or methods of transport.

## **7 Implementation of Action Plans**

On 30<sup>th</sup> January 2017 an AQMA was declared encompassing the Western end of Twynyrodyn Road. An action plan is being produced to address elevated levels of NO<sub>2</sub>. We aim to publish this shortly.

## **8 Conclusions and Proposed Actions**

### **8.1 Conclusions from New Monitoring Data**

Twynyrodyn Road continues to be of concern, with the annual mean NO<sub>2</sub> air quality objective of 40µg/m<sup>3</sup> being breached at 4 diffusion tube locations and the ECC real time monitor location. This is focussed around 55 Twynyrodyn Road. This is within the AQMA. The NO<sub>2</sub> levels in 2014 and 2015 are similar and after changes to traffic management in the town centre in 2013 appear to have settled at a level above the air quality objective of 40µg/m<sup>3</sup>.

MTCBC aim to address this through an action plan that will be consulted, published and implemented shortly.

There are no exceedences of air quality objectives outside the AQMA.

### **8.2 Conclusions relating to New Local Developments**

There are 2 developments with the potential to affect air quality.

The proposed bus station will introduce bus traffic to a low-traffic area and as such will cause an increase in NO<sub>2</sub>. Modelling has indicated the increase will remain within air quality objectives. By 2018, the next Updating and Screening Assessment it is likely to be close to or in use. Once it is in use diffusion tubes in the area will be used to confirm the predictions of the air quality assessment. As an air quality assessment has been carried out as part of the planning process, there is no need for a detailed assessment.

The Trago Mills retail development is likely to affect air quality and will be open during 2018. For the purposes of further assessment MTCBC will be installing at least one diffusion tube on Swansea Road in 2017 to gather background information. MTCBC do not intend to carry out a detailed assessment at this time as the impact of the development is uncertain due to the lack of comparable developments in South Wales. This will be reviewed once the development is in operation.

### **8.3 Other Conclusions**

MTCBC will be producing an action plan shortly, following the declaration on an AQMA on 30<sup>th</sup> January 2017. As the exceedence of the NO<sub>2</sub> annual mean AQO is related to traffic, the action plan will design and implement a number of strategies to improve traffic flow and reduce traffic use of Twynyrodyn Road.

The Environmental Health Department will continue to attend the Strategic Economic Regeneration and Tourism Board, in order to be aware of upcoming major developments. Developers and other departments within MTCBC will be advised on the need to factor maintaining and improving air quality through developments. Where necessary air quality modelling and assessments will be required as part of the planning process.

Other than those already referred to there are no planning applications pending approval likely to affect air quality.

### **8.4 Proposed Actions**

There is no monitoring data from 2015 that indicates the need for any further detailed assessments. A detailed assessment of Twynyrodyn Road has already been completed prior to declaring the AQMA.

No monitoring data has suggested the need for additional monitoring sites. Twynyrodyn Road will continue to be assessed using a number of diffusion tubes. However there will be additional diffusion tubes in relation to planned developments. Prior to the Trago Mills development at least one diffusion tube location will be opened on Swansea Road, and this will be maintained and if necessary additional locations included once the development opens. Additional monitoring locations will be installed once the new bus station is brought into use. No background monitoring will be carried out prior to this as the background has already been monitored by Capita as part of the planning application.

#### **Outstanding LAQM Tasks**

There are a number of tasks associated with the recently declared AQMA.

<b>Task</b>	<b>Provisional date</b>
Further assessment and action plan	AQMA date + 12 months
Review and assessment of AQMA	AP date + 12 months



## 9 References

<b>Title</b>	<b>Author</b>	<b>Date</b>
Prince Charles Hospital, Merthyr Tydfil Detailed Assessment of Air Quality	AEA for MTCBC	2011
Particulate Measurement at Twynrodyn Primary School Monitoring Site - 2015 Data	AQ Data Services for Miller Argent (South Wales) Ltd	2016
Detailed Assessment of Air Quality at Twynrodyn Road, Merthyr Tydfil	AQC for MTCBC	2009
Local Air Quality Management – Technical Guidance (LAQM TG(16))	DEFRA	2016
National Diffusion Tube Bias Adjustment Factor Spreadsheet (09/16)	DEFRA	2016
First Stage Review and Assessment	MTCBC	1998
Second Stage Review and Assessment	MTCBC	2000
Progress Report	MTCBC	2004
Updating and Screening Assessment	MTCBC	2004
Progress Report	MTCBC	2005
Updating and Screening Assessment	MTCBC	2006
Progress Report	MTCBC	2007
Progress Report	MTCBC	2008
Updating and Screening Assessment	MTCBC	2009
Progress Report	MTCBC	2010
Progress Report	MTCBC	2011
Updating and Screening Assessment	MTCBC	2012
Progress Report	MTCBC	2013
Progress Report	MTCBC	2014
Detailed Assessment of Air Quality at Twynrodyn Road, Merthyr Tydfil	MTCBC	2015
Updating and Screening Assessment	MTCBC	2015
Wellbeing of Future Generations (Wales) Act 2015	Welsh Government	2015

# Appendices

## Appendix 1: QA/QC Data for NO<sub>2</sub> diffusion tubes

### Factor from Local Co-location Studies

None - no co-location studies are currently undertaken by Merthyr Tydfil County Borough Council. Although there is a continuous ECC NO<sub>2</sub> monitor collocated with 2 diffusion tubes at 55 Twynyrodyn Road, the monitor is not suitable for a colocation study in that it is not a chemiluminescent monitor as specified in best practice.

### Diffusion Tube Bias Adjustment Factors

Diffusion tubes may systematically under- or over-read NO<sub>2</sub> concentrations compared to a chemiluminescent analyser. This is known as bias and can be adjusted for using a suitable bias adjustment factor. Applying a bias adjustment factor improves the accuracy of the data. Merthyr Tydfil County Borough Council does not undertake any co-location studies and as such applies a National bias adjustment factor.

The National bias adjustment factor applied was obtained from National Diffusion Tube Bias Adjustment Factor Spreadsheet: Spreadsheet Version Number: 09/16. This is the most up to date version of the spreadsheet at the time of writing. The tubes used are supplied and analysed by ESG. They are analysed using 50% TEA in acetone. 31 co-location studies were undertaken in England and Wales in 2012, and an overall bias adjustment factor of 0.79 was obtained as shown in the abstract below.

Analysed By	Method <small>To undo your selection, choose (All) from the pop-up list</small>	Year <small>To undo your selection, choose (All)</small>	Site Type	Local Authority	Length of Study (months)	Diffusion Tube Mean Conc. (Dm) (µg/m <sup>3</sup> )	Automatic Monitor Mean Conc. (Cm) (µg/m <sup>3</sup> )	Bias (B)	Tube Precision <sup>1</sup>	Bias Adjustment Factor (A) (Cm/Dm)
ESG Didcot	50% TEA in acetone	2015	R	Dumfries and Galloway Council	12	35	30	14.6%	G	0.87
ESG Didcot	50% TEA in acetone	2015	B	Gravesham Borough Council	12	40	30	34.1%	G	0.75
ESG Didcot	50% TEA in acetone	2015	B	Gravesham Borough Council	12	30	23	29.8%	P	0.77
ESG Didcot	50% TEA in acetone	2015	UI	North Lincolnshire	11	24	18	36.5%	P	0.73
ESG Didcot	50% TEA in acetone	2015	R	Swale Borough Council	12	41	33	24.1%	P	0.81
ESG Didcot	50% TEA in acetone	2015	R	Swale Borough Council	10	48	38	24.2%	G	0.81
ESG Didcot	50% TEA in acetone	2015	R	Swale Borough Council	11	38	30	28.4%	P	0.78
ESG Didcot	50% TEA in acetone	2015	R	Wrexham County Borough Council	12	19	19	0.6%	G	0.99
ESG Didcot	50% TEA in acetone	2015	KS	Marylebone Road Intercomparison	12	104	81	27.9%	G	0.78
ESG Didcot	50% TEA in acetone	2015	R	Vale of White Horse District Council	11	34	29	15.7%	G	0.86
ESG Didcot	50% TEA in acetone	2015	UI	Stockton on Tees	12	24	19	25.5%	G	0.80
ESG Didcot	50% TEA in acetone	2015	R	Stockton on Tees	12	17	14	19.4%	G	0.84
ESG Didcot	50% TEA in acetone	2015	KS	Suffolk Coastal DC	12	44	35	26.0%	P	0.79
ESG Didcot	50% TEA in acetone	2015	SU	Thanet District Council	9	17	15	10.6%	G	0.90
ESG Didcot	50% TEA in acetone	2015	R	Thanet District Council	12	27	23	17.8%	G	0.85
ESG Didcot	50% TEA in acetone	2015	B	Medway Council	12	21	12	77.3%	G	0.56
ESG Didcot	50% TEA in acetone	2015	R	Medway Council	11	32	23	42.6%	G	0.70
ESG Didcot	50% TEA in acetone	2015	R	North East Lincolnshire Council	10	34	28	21.2%	P	0.83
ESG Didcot	50% TEA in acetone	2015	R	North East Lincolnshire Council	11	39	28	38.6%	G	0.72
ESG Didcot	50% TEA in acetone	2015	R	North East Lincolnshire Council	11	55	47	16.2%	G	0.86
ESG Didcot	50% TEA in acetone	2015	R	Hambleton District Council	10	22	19	17.6%	G	0.85
ESG Didcot	50% TEA in acetone	2015	UB	City of York Council	11	24	16	50.6%	G	0.66
ESG Didcot	50% TEA in acetone	2015	R	City of York Council	11	38	27	31.9%	G	0.76
ESG Didcot	50% TEA in acetone	2015	R	City of York Council	11	34	25	34.8%	G	0.74
ESG Didcot	50% TEA in acetone	2015	R	City of York Council	12	39	28	41.1%	G	0.71
ESG Didcot	50% TEA in acetone	2015	R	Rugby Borough Council	12	23	21	10.6%	G	0.90
ESG Didcot	50% TEA in acetone	2015	R	Cambridge City Council	12	45	36	25.2%	G	0.80
ESG Didcot	50% TEA in acetone	2015	R	Derry City and Strabane District Council	12	38	29	31.7%	P	0.76
ESG Didcot	50% TEA in acetone	2015	R	Watford Borough Council	12	40	35	14.0%	S	0.88
ESG Didcot	50% TEA in acetone	2015		Overall Factor <sup>2</sup> (29 studies)					Use	0.79

### **Discussion of Choice of Factor to Use**

A national Bias Adjustment Factor has been used for the following reasons:

- There are currently no co-location studies undertaken in accordance with best practice in Merthyr Tydfil County Borough.
- The sites listed in the Bias Adjustment Factor spreadsheet are in generally comparable locations and;
- The diffusion tube mean concentrations measured at significant Merthyr sites are within the range of results obtained from the specified national co-location sites;

Although there are general similarities between the sites there are also some significant differences. The derived bias adjustment factor is therefore used with a degree of caution.

### **QA/QC of diffusion tube monitoring**

Diffusion tubes were manufactured and analysed by ESG. The absorbant is analysed for NO<sub>2</sub> concentration using 50% TEA in acetone. Diffusion tubes were kept and used in accordance with the manufacturer's instructions, and were left out for a minimum of 4 weeks.

Precision is the ability of a measurement to be consistently reproduced. Diffusion tubes are defined as having good precision when the coefficient of variation between triplicate tubes is <20% for eight periods out of 12, and <10% overall. In 2015 good precision was found in 21 out of 29 co-location studies. As such the precision for the diffusion tubes used in Merthyr Tydfil County Borough in 2015 is likely to be good.

ESG participates in the AIR PT NO<sub>2</sub> proficiency testing, an independent scheme supported by the Health and Safety Laboratory (HSL). It uses artificially spiked Palmes type diffusion tubes on a quarterly basis to determine a laboratory's analytical performance. Tubes are doped with a known amount of nitrate to determine accuracy, with at least two of the tubes being duplicates, to determine laboratory performance. A different mass of nitrate is used each quarter and reflect the typical analytical range encountered in NO<sub>2</sub> monitoring in the UK.

From this a performance score (z-score) is generated based on deviation between the known concentration and the value measured by the laboratory. Laboratories with 19 out of 20 (95%), from 5 rounds of testing, z-scores of  $\leq \pm 2$  provide satisfactory performance. For the quarters from January – February 2015 to January – February 2016, Environmental Services Group for over 95% (97.5%) of testing achieved z-scores within this range, and as such can be described as satisfactory.

## **Appendix 2: Quality Assurance and Quality Control Procedures for ECC NO<sub>2</sub> monitor**

The ECC is manufactured by AQMesh. The model is the AQMesh Pod. It was first produced in 2013 and has been through regular upgrades to improve performance.

The ECC is tested and calibrated by the manufacturer. In laboratory conditions accuracy is  $\pm 5$ ppb. It is designed with a sensor life and battery life of 2 years. After 2 years the battery and sensors should be replaced.

Colocations have been carried out against reference methods such as the chemiluminescent monitor. The correlations are variable, with v4.2 in 3 trials giving correlation of 0.70, 0.81 and 0.89. This shows the device should be used for indications of variations in NO<sub>2</sub>, rather than as an accurate NO<sub>2</sub> concentration.

Once installed on site there is a short period of stabilisation as the ECC adjusts to environmental conditions. During the 2-year lifespan of the sensors and battery no further calibration is required.

The device was collocated with 2 diffusion tubes and could be checked for significant differences. It was generally within 10% of diffusion tubes, with a tendency to under-read.

## **Appendix 3: Quality Assurance and Quality Control Procedures for PM<sub>10</sub> and PM<sub>2.5</sub> TEOM data**

### **PM Monitoring Adjustment**

#### **Instrument Service Routine**

Main QA and QC procedures for the Thermo Fisher TEOM analysers are carried out at the routine service visits, normally carried out at 6 monthly intervals by AQ Data Services.

#### **Filter Change Procedures**

At each site visit for exchange of the TEOM filters, a routine of record keeping has been established whereby the analyser operating parameters (flow, temperatures etc) are recorded before and after the filter change. This gives a reference datum of instrument performance at that time, and can often give good information on flows beginning to drop off etc, which can assist in arranging call-out of support engineers thereby preventing down time for the analyser.

#### **Data Collection / Storage**

Analog outputs from the 2 TEOM analysers are fed to the data logger system. To ensure correct analog to digital conversion, periodic checks are made to compare the data stored within the system against the internal data storage within each of the TEOM analyser control units.

#### **Data Management**

Data is downloaded from the data logger system using the Enviro2000 data management system. The data is initially “screened” to remove obvious spikes (both negative and positive spikes) caused by electrical disruption, after filter change, after analyser start-up etc.

### **PM Monitoring Adjustment**

Equivalence Testing has shown that the TEOM can under read possible losses of volatile material from the TEOM filter.

Data can be corrected for the loss of volatiles by applying the King's College London Volatile Correction Model – a spreadsheet for Correction. The VCM takes FDMS purge measurements from the two nearest FDMS equipped TEOM analysers, and an average of all the other FDMS purge measurements within 130 km. The two nearest sites are Port Talbot AURN at Margam Fire Station and Newport AURN. More information on the VCM can be found at <http://www.volatile-correction-model.info/>.

At the time of writing data from the FDMS purge measurements used had been ratified and the PM<sub>10</sub> and PM<sub>2.5</sub> data should be considered reliable.



## Appendix 4: Monthly diffusion tube data; raw data, un-ratified and non-bias adjusted.

Site ID	Location	Nitrogen dioxide concentration ( $\mu\text{g}/\text{m}^3$ )												
		Period 1	Period 2	Period 3	Period 4	Period 5	Period 6	Period 7	Period 8	Period 9	Period 10	Period 11	Period 12	Annual mean
WAQF 1	Imperial Hotel	36.4	37.1	30.7	30.0	14.2	22.5	31.0	31.4	28.4	32.2	32.2	26.9	29.4
WAQF 2	Civic Centre	10.5	25.1	20.4	31.1	10.2	15.4	26.1	24.1	21.5	24.4	21.3	19.4	20.8
WAQF 3	Twynrodyn Infants School	17.7	15.7	17.6	24.8	6.5	11.0	14.3	15.9	15.0	18.9	16.1	15.9	15.8
WAQF 15	Victoria Street	43.7	38.5	28.4	28.5	13.8	19.2	29.8	29.8	33.4	32.4	32.2	28.6	29.9
WAQF 16	Six Bells Estate	23.6	22.5	15.9	17.0	4.4	9.0	11.8	11.1	12.1	14.3	10.1	12.4	13.7
WAQF 25	Upper Dowlais	34.2	29.5	29.8	45.9	13.9	28.3	35.5	37.0	35.8	39.0	26.0	30.0	32.1
WAQF 29	55 Twynrodyn Road	70.8	56.4	59.9	69.9	30.9	46.1	63.5	56.7	63.6	63.9	53.5	42.2	56.5
29J	55 Twynrodyn Road (collocated)	62.2	67.6	60.6	88.5	32.1	55.4	66.6	63.4	56.4	64.0	52.6	45.8	59.6
29A	91 Twynrodyn Road	41.3	31.6		59.0	18.2	31.1	41.6	41.6	34.1	32.5	34.6	31.8	36.1
29B	15 Arfryn Terrace	39.3	50.3	38.6	60.2	20.7	35.5	47.4	47.3	38.6	43.0	39.8	46.0	42.2
29D	17 Court Terrace	38.0	47.4	37.9	55.3	16.5	34.0	32.2	39.3	39.4	38.1	33.6	37.6	37.4
29E	40 William Street	30.5	31.1	28.0	39.4	16.4	21.1	31.2	29.3	25.7	28.2	29.1	26.6	28.1
29F	Mount View Mardy Street	27.6	31.0	25.7	38.5	10.8	22.1	28.3	30.1	27.5	34.0	20.9	22.2	26.6

## Merthyr Tydfil County Borough Council

29G	64 Gilfach Cynon	33.5	40.0	28.2	38.4	14.7	22.6	30.2	31.7	30.7	32.1	24.9		29.7
29H	51 Twynyrodyn Road	70.0	63.0	57.6	75.6	29.4	47.2	56.7	63.9	60.1	63.5	53.4	44.1	57.0
29I	3 Gilfach Cynon	56.5	57.4	37.0	71.6	24.7	40.7	53.7	52.4	49.7	46.5	47.3	39.5	48.1
WAQF 30	Quakers Yard	20.7	21.8	14.7	20.2	7.0	12.7	16.2	16.3	14.4	16.3	17.1	18.2	16.3
WAQF 31	4 Erw Las	18.0	19.7	13.6	19.5	7.8	12.0	14.5	12.3	16.0	19.7	11.8	16.0	15.1
36	15 Lower High Street	36.9	37.6	33.6	46.9	14.3	27.2	33.5	34.4	36.2	40.5	32.2	29.5	33.6
38	11 Alexandra Terrace (lamppost)	66.9	67.4	58.8	67.6	26.8	46.5	56.1	51.5	58.8	57.1	46.5	41.4	53.8
39	11 Alexandra Terrace (façade)	56.3	47.5	47.3	69.4	25.6	39.8	47.3	39.3	52.0	54.3	46.7	31.9	46.5
44	1 Alma Street	29.3	32.5	23.9	29.5	12.8	19.2	24.9		25.1	23.8	26.6	26.9	25.0
42	5 Alma Street	23.2	20.9	21.3	28.9	9.0	15.6	21.8	21.5	20.1	25.0	18.4	22.2	20.7
43	9 Alma Street	28.0	30.5	24.7	30.2	9.5	16.1	20.9	21.7	16.7	24.6	22.9	22.9	22.4

## **Appendix 5: ECC Meteorological data, NO<sub>2</sub> and O<sub>3</sub> 15-minute readings**

The data is available on request.