



# **Merthyr Tydfil County Borough Council**

## **2017 Air Quality Progress Report**

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

Date (September 2017)

## Merthyr Tydfil County Borough Council

|                                |   |
|--------------------------------|---|
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## Executive Summary

### Crynodeb Gweithredol

Mae'r adroddiad hwn yn cyflawni anghenion y broses Rheoli Ansawdd Aer yn Lleol (RhAALI) fel y nodir yn Adran IV, Deddf yr Amgylchedd (1995,) y Strategaeth Ansawdd Aer ar gyfer Lloegr, yr Alban, Cymru a Gogledd Iwerddon 2017 a'r dogfennau Polisi a'r Canllawiau Technegol perthnasol. Mae'r broses RhAALI yn gosod rheidrwydd ar bob awdurdod lleol i adolygu ac asesu'n gyson ansawdd yr aer yn eu hardaloedd a phenderfynu a fydd amcanion ansawdd yr aer yn debygol o gael eu cyflawni ai peidio. Lle ystyrir y bydd gormodiant yn debygol, bydd rhaid i'r awdurdod lleol ddatgan Ardal Rheoli Ansawdd Aer (ARhAA) a pharatoi Cynllun Gweithredu Ansawdd Aer (CGAA) a fydd yn nodi'r mesurau y mae'n bwriadu eu rhoi yn eu lle er mwyn cyflawni'r amcanion.

Prif achos llygredd aer ym Mwrdeistref Sirol Merthyr Tudful yw traffig ar y ffordd. Gan fod gormodiant i amcanion cymedrig ansawdd aer NO<sub>2</sub>, dynodwyd AAA (Amcan Ansawdd Aer) yn ardal Heol Twynyrodyn ar 30 Ionawr 2017 a gwnaethpwyd datganiad ARhAA. Ym 2016, dynododd tiwbiau trylediad fod lefelau NO<sub>2</sub> mewn safleoedd o

### Executive Summary

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.

The main cause of air pollution in Merthyr Tydfil County Borough is road traffic. As exceedances of the NO<sub>2</sub> annual mean air quality objective, AQO, have been detected in the Twynyrodyn Road area on 30th January 2017 an AQMA was declared. Diffusion tubes indicated that in 2016 NO<sub>2</sub> at sites around 55

amgylch 55 Heol Twynrodyn wedi croesi lefel gormodiant yr amcan ansawdd aer cymedrig, blynyddol – yr AAA neu ei fod oddi fewn i 10% iddo. Mae'r holl diwbiau trylediad a achosodd bryder oddi fewn i'r ARhAA presennol.

Mae CBSMT yn datblygu cynllun gweithredu ar gyfer ymgynghoriad a chyhoeddiad. Mae'n debygol o gynnwys addasiadau arfaethedig ar gyfer lefelau traffig ar Heol Twynrodyn drwy ostegu traffig a chynnig llwybrau amgen. Mae llwybr amgen posib, i'r ochr Ogleddol o Heol Twynrodyn yn cael ei ystyried a gan ragweld hyn, mae 4 safle ychwanegol wedi cael eu creu ar gyfer gosod tiwbiau trylediad.

Mae'n bosib y gall dau ddatblygiad effeithio ar ansawdd yr aer. Yn gyntaf, cais cynllunio i adeiladu gorsaf fysiau newydd ar Stryd yr Alarch. Dynododd modelu y bydd AAA yr NO<sub>2</sub> yn cydymffurfio â chanllawiau. Mae CBSMT yn bwriadu cadarnhau hyn drwy ddefnyddio tiwbiau trylediad. Yn ail, mae datblygiad manwerthu Trago Mills wrthi'n cael ei adeiladu a'r bwriad yw ei agor yn gynnar ym 2018. Mae datblygiadau tebyg yn Ne-orllewin Lloegr wedi arwain at dagfeydd a chynnydd mewn NO<sub>2</sub>. Agorwyd tiwb trylediad ar Heol Abertawe yn Ebrill

Twynrodyn Road exceeded the annual mean air quality objective, AQO, or were within 10% of it. All the diffusion tubes of concern are within the existing AQMA.

MTCBC are developing an action plan for consultation and publication. It is likely to include proposed modifications to traffic volumes along Twynrodyn Road by traffic calming and alternative routes. A potential alternative route to the North side of Twynrodyn Road is being considered, and in anticipation 4 additional diffusion tube sites have been installed.

There are two developments with the potential to affect air quality. Firstly, a planning application to build a new bus station at Swan Street. Modelling indicated the NO<sub>2</sub> AQO will be complied with. MTCBC intends to confirm this using diffusion tubes. Secondly Trago Mills retail development is under construction, due to open in early 2018. Similar developments in the South West of England have resulted in congestion and elevated NO<sub>2</sub>. A diffusion tube was opened on Swansea Road in April 2017 to monitor background NO<sub>2</sub> for comparison when the development opens in early 2018.

2017 i fonitro NO<sub>2</sub> cefndirol er mwyn ei gymharu â phan fydd y datblygiad yn agor yn gynnar ym 2018.

Mae Adran Iechyd yr Amgylchedd yn ymgynghorai statudol ar geisiadau cynllunio ac yn mynychu'r Bwrdd Strategaeth Twristiaeth ac Adfywiad Economaidd. Mae hyn yn ein galluogi i ystyried a chynghori ar ansawdd aer yn ystod y broses ddatblygu.

The Environmental Health Department is a statutory consultee on planning applications, and attends the Strategic Tourism and Economic Regeneration Board. This allows us to consider and advise on air quality in the development process.

**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   |
| NO <sub>x</sub>   | 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. In the Northern part of the borough the villages of Vaynor and Pontsticill are within 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 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. 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 Twynyrodyn Road which has relatively high traffic flows as a result. Twynyrodyn Road is the Authority's only AQMA.

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 has declined dramatically over the last 50 years or so and today there are only a few industrial processes within the

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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 Twynnyroddyn 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 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 mean annual | 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 mean annual | 31.12.2003             |
| Carbon monoxide                                      | 10 $\text{mg}/\text{m}^3$   | Running mean 8-hour | 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.

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- The Progress Report 2008 found NO<sub>2</sub> levels had increased and at WAQF 29, 55 Twynrodyn Road, a marginal exceedence 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 Twynrodyn 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. NO<sub>2</sub> reduced. Based on the reduction it was considered no longer necessary to carry out further detailed assessments or declare an AQMA.
- 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 exceedences 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) 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 Twynrodyn Road, an unusually marked exceedance was identified. It was considered necessary to further increase the number of monitoring sites on Twynrodyn 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 of those identified in the 2009 USA requiring further study) and modelled NO<sub>2</sub> and SO<sub>2</sub> levels in the vicinity. It concluded that emissions will not

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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> complied with the AQO.
- There were no new developments, and no proposed developments, which could be considered to adversely affect air quality.
- Of the 24 NO<sub>2</sub> 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 NO<sub>2</sub> 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.
- Based on the Progress Report 2014 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**

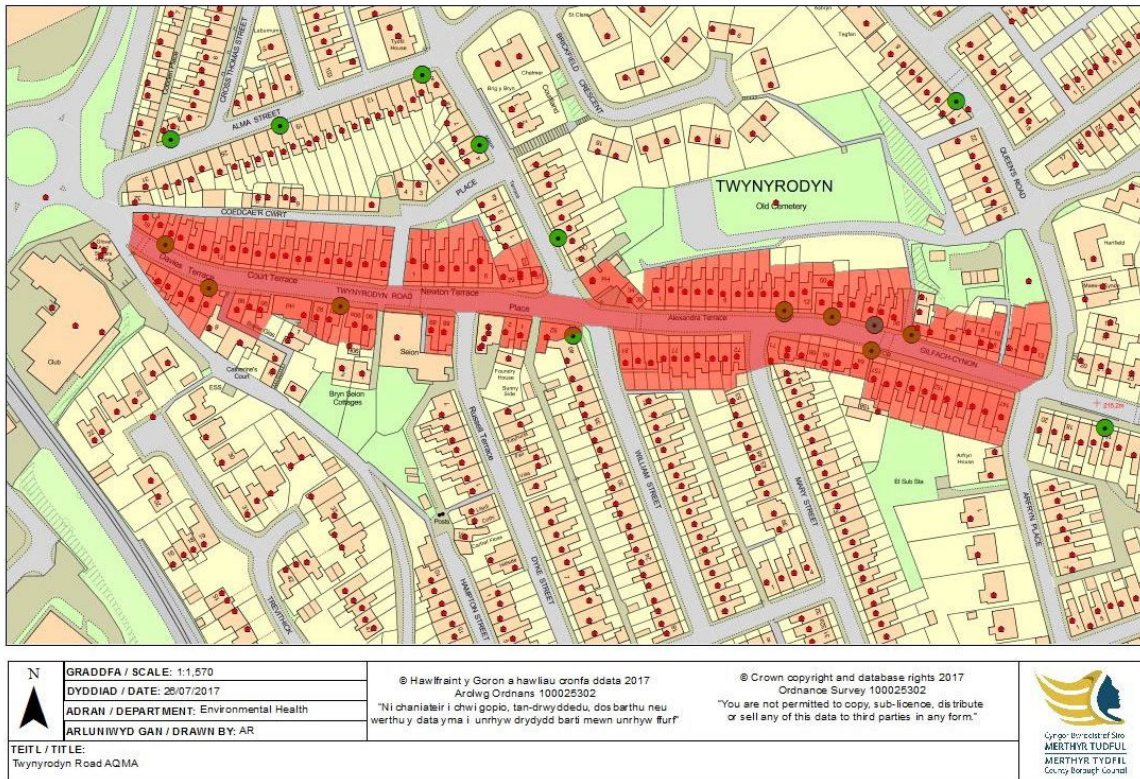
- Elevated NO<sub>2</sub> on Twynyrodyn Road was associated with traffic. Wind speed and direction, and two storey terraced housing without front gardens resulted in nitrogen dioxide accumulating around 55 Twynyrodyn Road.
- Real time monitoring showed this was predominantly associated with uphill traffic flowing away from the town centre and Tesco supermarket during the early evening.
- It was considered necessary to declare an AQMA from the Western End of Twynyrodyn 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> complied with the AQO.
- 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 Twynyrodyn Road exceeded the annual mean air quality objective.
- The Progress Report 2016 found the exceedences were contained within the AQMA. Additional monitoring was proposed in anticipation of the development and opening of Trago Mills on Swansea Road.



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. Only data on PM<sub>10</sub> is included in this report. 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. In 2016 the batteries and sensors needed replacing. The performance of the

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monitor deteriorated during 2016 and only 7 months data was obtained. This data was compromised by problems with the ozone sensor. 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. Data is relayed to an external server and can be accessed and downloaded via a web page.

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, in the detailed assessment, data was compared with traffic data and meteorological data (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 tube.



Figure 2.1 - Map of Automatic Monitoring Site – TEOM operated by Miller Argent

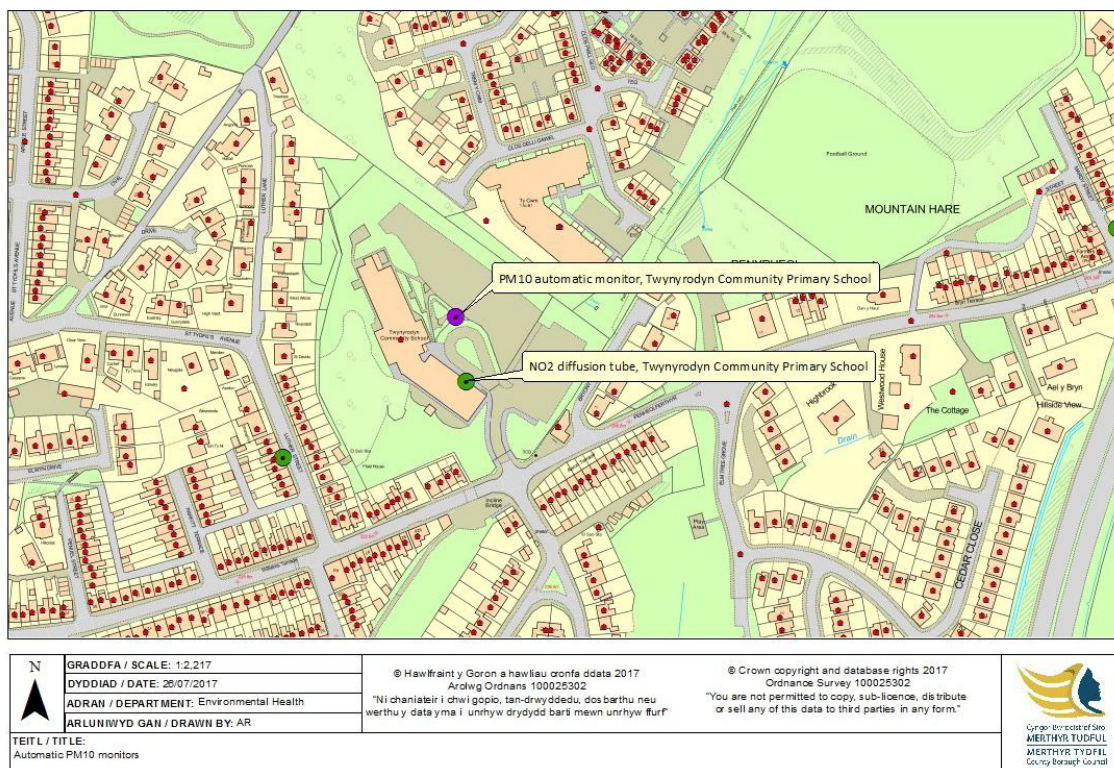


Figure 2.2 - Maps of Automatic Monitoring Sites – ECC monitor (dark green) and collocated diffusion tubes (light green)

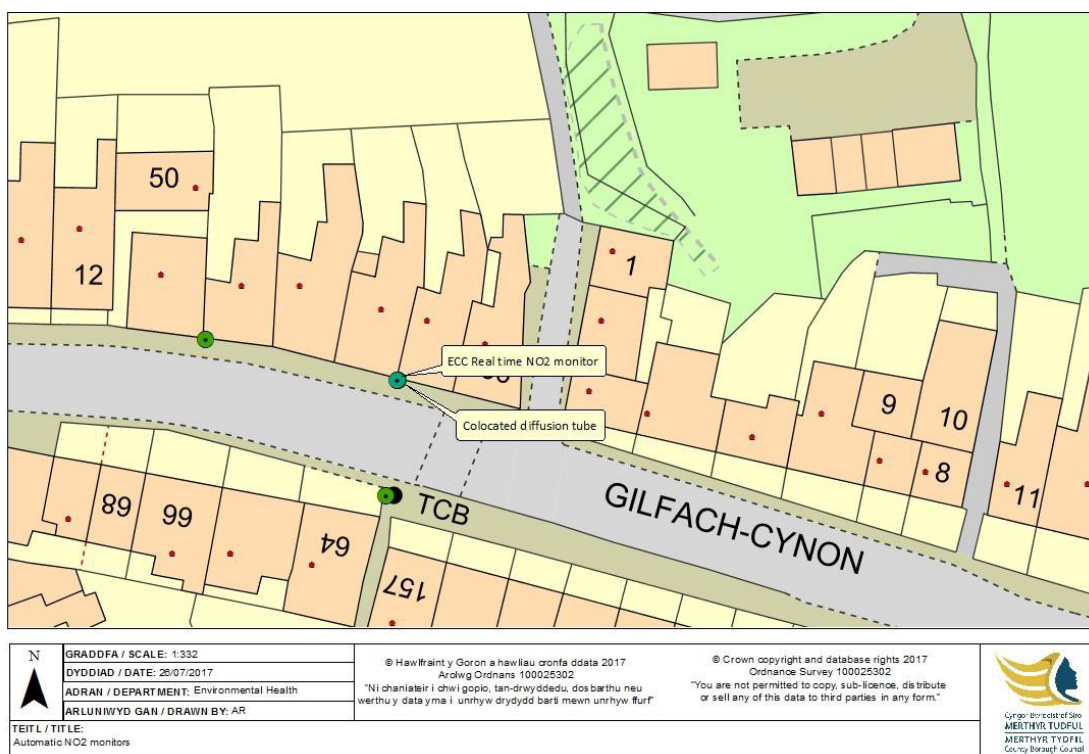


Table 2.1 – Details of Automatic Monitoring Sites

| Site Name              | Site Type | X OS Grid Reference | Y OS Grid Reference | Inlet Height (m) | Pollutants Monitored                  | In AQMA? | Monitoring Technique | Relevant Exposure?<br>(Y/N with distance (m) from monitoring site to relevant exposure) | Distance to Kerb of Nearest Road (m)<br>(N/A if not applicable) | Does this Location Represent Worst-Case Exposure? |
|------------------------|-----------|---------------------|---------------------|------------------|---------------------------------------|----------|----------------------|---|---|---|
| APM1 Twynroddyn School | Suburban  | 305821              | 206008              | 2.43             | PM <sub>10</sub><br>PM <sub>2.5</sub> | N        | TEOM                 | Y (0m)  | N/A   | N   |
| ECC                    | Kerbside  | 305416              | 205867              | 2.75             | 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. In April 2017 a number of new sites were opened to monitor NO<sub>2</sub> along roads that may be affected by the AQMA action plan, near the Trago Mills development scheduled to open in December 2017, and another site with a historic result within 10% of the AQO.







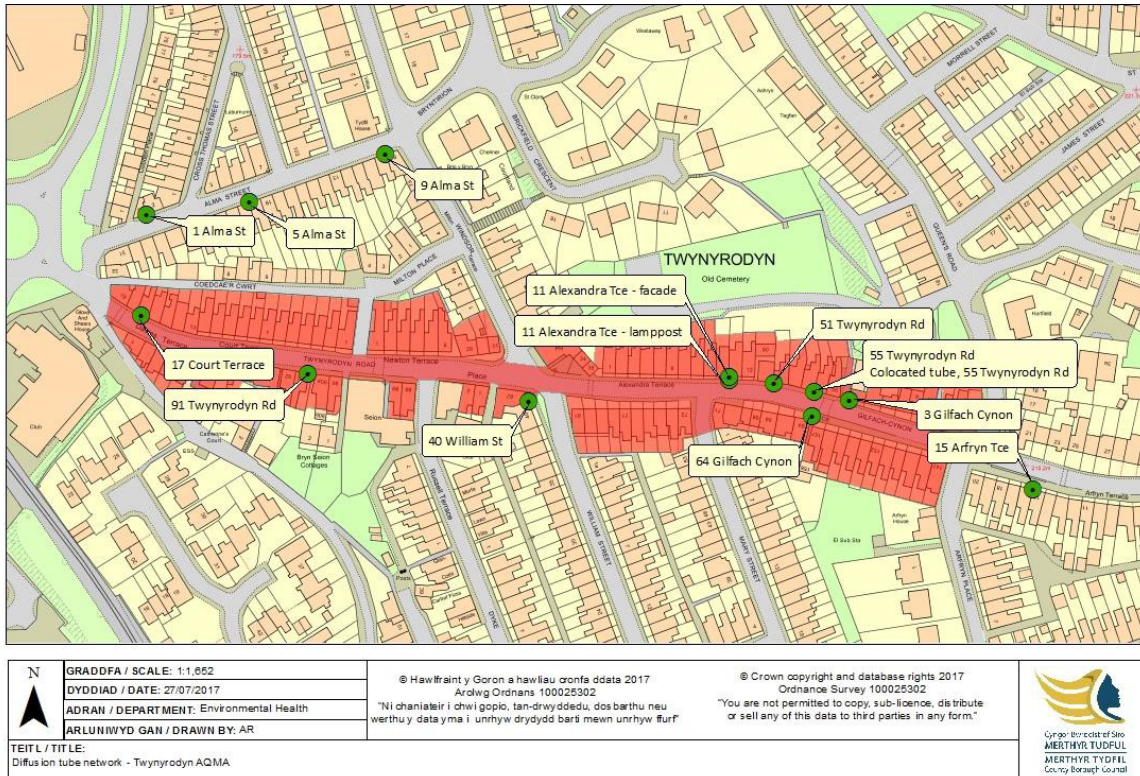




Table 2.2 – Details of Non- Automatic Monitoring Sites

| 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? |
|---------|---|------------------|---------------------|---------------------|-----------------|----------------------|----------|---|--|--|---|
| 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 Community Primary School (WAQF3) | Suburban         | 305832              | 205941              | 2.1             | NO <sub>2</sub>      | N        | N   | Y (56.0m)  | 57m  | N   |

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| <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> |
|----------------|-----------------------------|------------------|----------------------------|----------------------------|------------------------|-----------------------------|-----------------|--|---|---|--|
| 15             | Victoria Street (WAQF15)    | Urban Centre     | 304866                     | 206137                     | 2.4                    | NO <sub>2</sub>             | N               | N  | Y (0.15m)   | 2.6m  | Y  |
| 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  |

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| <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> |
|----------------|---------------------------------------|------------------|----------------------------|----------------------------|------------------------|-----------------------------|-----------------|--|---|---|--|
| 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  |

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| <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> |
|----------------|-------------------------------|------------------|----------------------------|----------------------------|------------------------|-----------------------------|-----------------|--|---|---|--|
| 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  |

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| <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> |
|----------------|--|------------------|----------------------------|----------------------------|------------------------|-----------------------------|-----------------|--|---|---|--|
| 30             | Quakers Yard<br>(WAFQ30)                   | Suburban         | 309573                     | 196518                     | 1.9                    | NO <sub>2</sub>             | N               | N  | Y (0.15m)   | 4.0m  | N  |
| 31             | 4 Erw Las<br>(WAFQ31)                      | Suburban         | 303360                     | 206822                     | 2.0                    | NO <sub>2</sub>             | N               | N  | Y (0.15m)   | 37.0m   | N  |
| 36             | 15 Lower High Street<br>(36)               | Roadside         | 305001                     | 205763                     | 2.3                    | NO <sub>2</sub>             | N               | N  | Y (0.15m)   | 3.6m  | Y  |
| 38             | 11 Alexandra Terrace<br>(lamppost)<br>(38) | Roadside         | 305382                     | 205872                     | 3.0                    | NO <sub>2</sub>             | Y               | N  | Y(1.6m)   | 1.45m   | Y  |

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| <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> |
|----------------|------------------------------------|------------------|----------------------------|----------------------------|------------------------|-----------------------------|-----------------|--|---|---|--|
| 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**

Although data was obtained from the ECC there are serious concerns with regards to its quality. Additionally the device had a battery failure in July and was sent to the manufacturers to have this replaced. Following its return it had a period of stabilisation and as such data from November and December is not included. The data is included for completeness, but is not considered as useful or reliable as the diffusion tubes, an established methodology. It appears to be underreading, probably due to the ozone sensor giving spurious readings.

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 2016 % <sup>b</sup> | Annual Mean Concentration (µg/m <sup>3</sup> ) |                    |                         |                    |                   |
|---------|-----------|--------------|---|--|--|--------------------|-------------------------|--------------------|-------------------|
|         |           |              |   |  | 2012* <sup>c</sup>                             | 2013* <sup>c</sup> | 2014* <sup>c</sup>      | 2015* <sup>c</sup> | 2016 <sup>c</sup> |
| ECC     | Roadside  | Y            |   | 57                                     |  |                    | <b>52.3<br/>(158.4)</b> | <b>46.1</b>        | 39.7              |

**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



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 2016 % <sup>b</sup> | Number of Hourly Means > 200µg/m <sup>3</sup> |                    |                    |                    |                   |
|---------|-----------|--------------|---|--|---|--------------------|--------------------|--------------------|-------------------|
|         |           |              |   |  | 2012* <sup>c</sup>                            | 2013* <sup>c</sup> | 2014* <sup>c</sup> | 2015* <sup>c</sup> | 2016 <sup>c</sup> |
| ECC     | Roadside  | Y            |   | 59                                     |   |                    | 1                  | 0                  | 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)

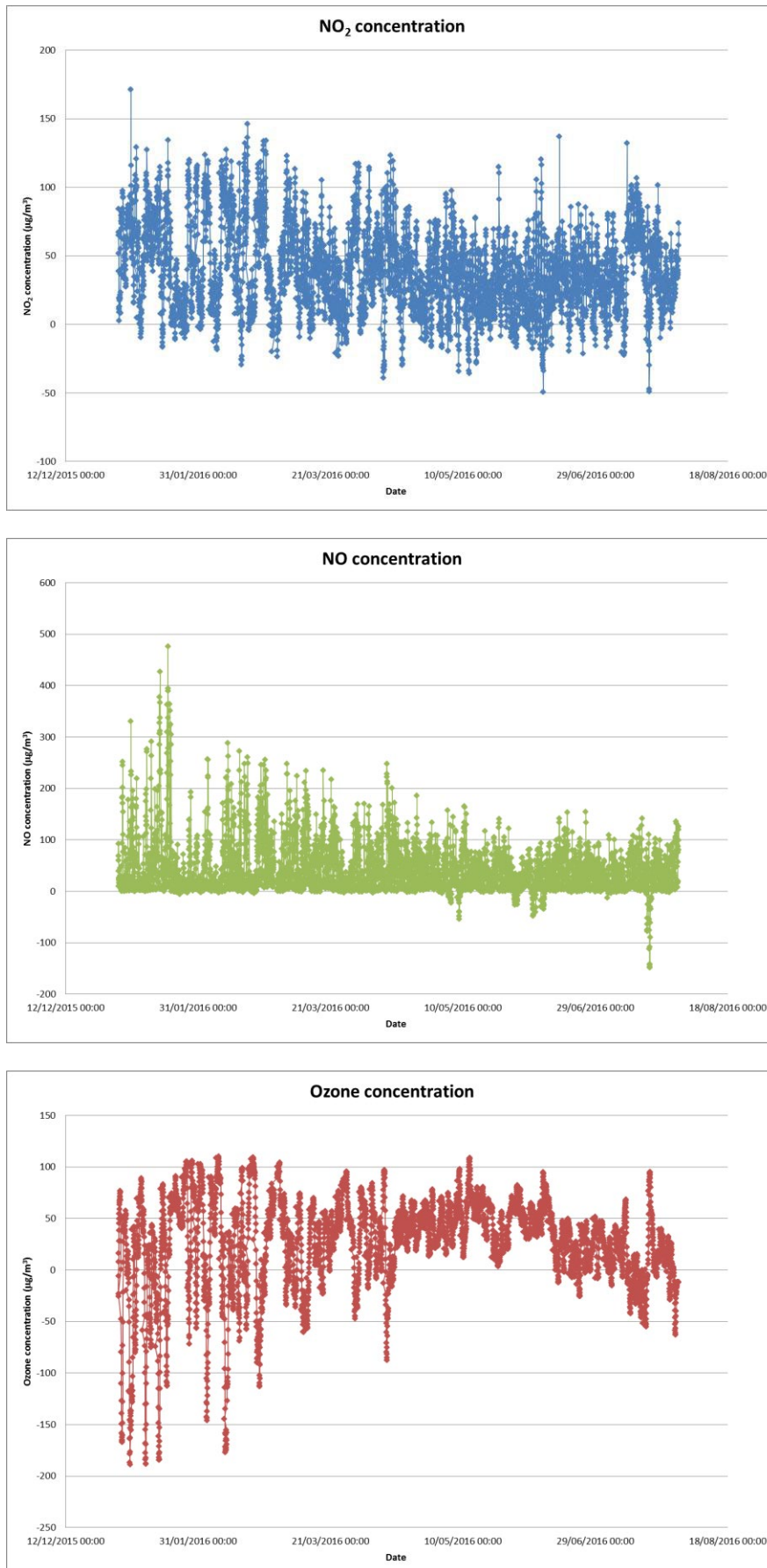
<sup>a</sup> i.e. data capture for the monitoring period, in cases where monitoring was only carried out for part of the year

<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 ECC measurements of NO<sub>2</sub>, NO and Ozone



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As shown by Figure 2.4, there are a number of negative gas concentrations recorded by the ECC. It measures NO, Ozone and NO<sub>2</sub>. The sensors provide raw data, however they are affected by cross gas effects. Algorithms are applied to scale the gas concentrations in order to adjust for cross gas effects.

The NO concentration follows the pattern that would be expected, however the concentration of NO<sub>2</sub> is frequently negative, as is more noticeably the ozone concentration. It appears as though ozone is misreading and this is causing anomalous scaled measurements of other gases.

It is likely the concentration of NO<sub>2</sub> is in excess of 39.7µg/m<sup>3</sup>, as such a substantial reduction on other years would not be expected. It is also significantly lower than the results. The results are a period mean, and have not been adjusted due to concerns over their quality.

In late 2016 the monitor went through maintenance, which included the provision of upgraded sensors. The upgraded NO<sub>2</sub> sensor is less affected by ozone, and as such it will give a higher level of accuracy to figures for 2017.

**Diffusion Tube Monitoring Data**

Diffusion tube data for 2016 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 declared in January 2017.

Table 2.5 – Results of NO<sub>2</sub> Diffusion Tubes 2016

| Site ID | Location                                     | Site Type        | Within AQMA? | Triplicate or Co-located Tube | Full Calendar Year Data Capture 2016 (Number of Months or %) <sup>a</sup> | 2016 Annual Mean Concentration (µg/m <sup>3</sup> ) - Bias Adjustment factor = 0.77 <sup>b</sup> |
|---------|--|------------------|--------------|-------------------------------|---|--|
| 1       | Imperial Hotel (WAQF1)                       | Roadside         | N            | N                             | 11  | 22.2   |
| 2       | Civic Centre (WAQF2)                         | Urban background | N            | N                             | 11  | 18.1   |
| 3       | Twynnyrobyn Community Primary School (WAQF3) | Suburban         | N            | N                             | 10  | 13.0   |
| 15      | Victoria Street (WAQF15)                     | Urban Centre     | N            | N                             | 11  | 22.9   |
| 16      | Six Bells Estate (WAQF16)                    | Suburban         | N            | N                             | 12  | 10.6   |

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| Site ID | Location                              | Site Type | Within AQMA? | Triplicate or Co-located Tube | Full Calendar Year Data Capture 2016 (Number of Months or %) <sup>a</sup> | 2016 Annual Mean Concentration ( $\mu\text{g}/\text{m}^3$ ) - Bias Adjustment factor = 0.77 <sup>b</sup> |
|---------|---------------------------------------|-----------|--------------|-------------------------------|---|--|
| 25      | Upper Dowlais (WAQF25)                | Roadside  | N            | N                             | 11  | 26.4   |
| 29      | 55 Twynyrodyn Road (WAQF29)           | Roadside  | Y            | Y                             | 10  | <b>43.2</b>  |
| 29J     | 55 Twynyrodyn Road (collocated) (29J) | Roadside  | Y            | Y                             | 12  | <b>44.0</b>  |
| 29A     | 91 Twynyrodyn Road (29A)              | Roadside  | Y            | N                             | 10  | 25.9   |
| 29B     | 15 Arfryn Terrace (29B)               | Roadside  | Y            | N                             | 12  | 31.5   |

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| Site ID | Location                      | Site Type | Within AQMA? | Triplicate or Co-located Tube | Full Calendar Year Data Capture 2016 (Number of Months or %) <sup>a</sup> | 2016 Annual Mean Concentration ( $\mu\text{g}/\text{m}^3$ ) - Bias Adjustment factor = 0.77 <sup>b</sup> |
|---------|-------------------------------|-----------|--------------|-------------------------------|---|--|
| 29D     | 17 Court Terrace (29D)        | Roadside  | Y            | N                             | 12  | 31.1   |
| 29E     | 40 William Street (29E)       | Roadside  | Y            | N                             | 12  | 21.5   |
| 29F     | Mount View Mardy Street (29F) | Roadside  | N            | N                             | 12  | 23.2   |
| 29G     | 64 Gilfach Cynon (29G)        | Roadside  | Y            | N                             | 12  | 24.5   |
| 29H     | 51 Twynyrodyn Road (29H)      | Roadside  | Y            | N                             | 12  | <b>48.5</b>  |
| 29I     | 3 Gilfach Cynon (29I)         | Roadside  | Y            | N                             | 12  | 37.8   |
| 30      | Quakers Yard (WAQF30)         | Suburban  | N            | N                             | 12  | 12.8   |
| 31      | 4 Erw Las (WAQF31)            | Suburban  | N            | N                             | 12  | 12.6   |

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| Site ID | Location                             | Site Type | Within AQMA? | Triplicate or Co-located Tube | Full Calendar Year Data Capture 2016 (Number of Months or %) <sup>a</sup> | 2016 Annual Mean Concentration ( $\mu\text{g}/\text{m}^3$ ) - Bias Adjustment factor = 0.77 <sup>b</sup> |
|---------|--------------------------------------|-----------|--------------|-------------------------------|---|--|
| 36      | 15 Lower High Street (36)            | Roadside  | N            | N                             | 10  | 23.5   |
| 38      | 11 Alexandra Terrace (lamppost) (38) | Roadside  | Y            | N                             | 12  | <b>40.9</b>  |
| 39      | 11 Alexandra Terrace (facade) (39)   | Kerbside  | Y            | N                             | 12  | 36.0   |
| 44      | 1 Alma Street (44)                   | Roadside  | N            | N                             | 12  | 19.8   |
| 42      | 5 Alma Street (42)                   | Roadside  | N            | N                             | 12  | 17.0   |
| 43      | 9 Alma Street (43)                   | Roadside  | N            | N                             | 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 > 60µg/m<sup>3</sup>, 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 (2012 to 2016)

| Site ID | Site Type                                     | Location         | Within AQMA? | Annual Mean Concentration (µg/m <sup>3</sup> ) - Adjusted for Bias <sup>a</sup> |                                      |                                      |                                      |                                      |
|---------|---|------------------|--------------|---|--------------------------------------|--------------------------------------|--------------------------------------|--------------------------------------|
|         |   |                  |              | 2012 (Bias Adjustment Factor = 0.69)  | 2013 (Bias Adjustment Factor = 0.85) | 2014 (Bias Adjustment Factor = 0.81) | 2015 (Bias Adjustment Factor = 0.79) | 2016 (Bias Adjustment Factor = 0.77) |
| 1       | Imperial Hotel (WAQF1)                        | Roadside         | N            | 24.1  | 26.3                                 | 23.1                                 | 23.2                                 | 22.2                                 |
| 2       | Civic Centre (WAQF2)                          | Urban background | N            | 16.7  | 21.8                                 | 19.4                                 | 16.4                                 | 18.1                                 |
| 3       | Twynnyroddyn Community Primary School (WAQF3) | Suburban         | N            | 11.2  | 13.9                                 | 12.4                                 | 12.5                                 | 13.0                                 |
| 15      | Victoria Street (WAQF15)                      | Urban Centre     | N            | 20.9  | 26.2                                 | 24.3                                 | 23.6                                 | 22.9                                 |

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| Site ID | Site Type                               | Location | Within AQMA? | Annual Mean Concentration ( $\mu\text{g}/\text{m}^3$ ) - Adjusted for Bias <sup>a</sup> |                                      |                                      |                                      |                                      |
|---------|---|----------|--------------|---|--------------------------------------|--------------------------------------|--------------------------------------|--------------------------------------|
|         |   |          |              | 2012 (Bias Adjustment Factor = 0.69)  | 2013 (Bias Adjustment Factor = 0.85) | 2014 (Bias Adjustment Factor = 0.81) | 2015 (Bias Adjustment Factor = 0.79) | 2016 (Bias Adjustment Factor = 0.77) |
| 16      | Six Bells Estate (WAQF16)               | Suburban | N            | 10.8  | 13.4                                 | 11.4                                 | 10.8                                 | 10.6                                 |
| 25      | Upper Dowlais (WAQF25)                  | Roadside | N            | 22.7  | 28.7                                 | 26.1                                 | 25.3                                 | 26.4                                 |
| 29      | 55 Twynnyroddyn Road (WAQF29)           | Roadside | Y            | <b>41.9</b>   | <b>49.8</b>                          | <b>45.7</b>                          | <b>44.6</b>                          | <b>43.2</b>                          |
| 29J     | 55 Twynnyroddyn Road (collocated) (29J) | Roadside | Y            |   | <b>57.0</b>                          | <b>47.5</b>                          | <b>47.1</b>                          | <b>44.0</b>                          |

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| Site ID | Site Type                     | Location | Within AQMA? | Annual Mean Concentration (µg/m³) - Adjusted for Bias <sup>a</sup> |                                      |                                      |                                      |                                      |
|---------|-------------------------------|----------|--------------|--|--------------------------------------|--------------------------------------|--------------------------------------|--------------------------------------|
|         |                               |          |              | 2012 (Bias Adjustment Factor = 0.69)                               | 2013 (Bias Adjustment Factor = 0.85) | 2014 (Bias Adjustment Factor = 0.81) | 2015 (Bias Adjustment Factor = 0.79) | 2016 (Bias Adjustment Factor = 0.77) |
| 29A     | 91 Twynrodyn Road (29A)       | Roadside | Y            | 29.2   | 32.6                                 | 29.1                                 | 28.5                                 | 25.9                                 |
| 29B     | 15 Arfryn Terrace (29B)       | Roadside | Y            | 28.0   | 33.1                                 | 33.4                                 | 33.4                                 | 31.5                                 |
| 29D     | 17 Court Terrace (29D)        | Roadside | Y            | 28.4   | 31.2                                 | 30.6                                 | 29.6                                 | 31.1                                 |
| 29E     | 40 William Street (29E)       | Roadside | Y            | 21.7   | 24.7                                 | 22.2                                 | 22.2                                 | 21.5                                 |
| 29F     | Mount View Mardy Street (29F) | Roadside | N            | 18.7   | 22.9                                 | 22.3                                 | 21.0                                 | 23.2                                 |
| 29G     | 64 Gilfach Cynon (29G)        | Roadside | Y            | 22.5   | 26.0                                 | 23.1                                 | 23.5                                 | 24.5                                 |

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| Site ID | Site Type                  | Location | Within AQMA? | Annual Mean Concentration ( $\mu\text{g}/\text{m}^3$ ) - Adjusted for Bias <sup>a</sup> |                                      |                                      |                                      |                                      |
|---------|----------------------------|----------|--------------|---|--------------------------------------|--------------------------------------|--------------------------------------|--------------------------------------|
|         |                            |          |              | 2012 (Bias Adjustment Factor = 0.69)  | 2013 (Bias Adjustment Factor = 0.85) | 2014 (Bias Adjustment Factor = 0.81) | 2015 (Bias Adjustment Factor = 0.79) | 2016 (Bias Adjustment Factor = 0.77) |
| 29H     | 51 Twynnyroddyn Road (29H) | Roadside | Y            | <b>41.3</b>   | <b>51.1</b>                          | <b>45.9</b>                          | <b>45.1</b>                          | <b>48.5</b>                          |
| 29I     | 3 Gilfach Cynon (29I)      | Roadside | Y            | 34.7  | 38.0                                 | 36.5                                 | 38.0                                 | 37.8                                 |
| 30      | Quakers Yard (WAQF30)      | Suburban | N            | 11.3  | 13.9                                 | 12.8                                 | 12.9                                 | 12.8                                 |
| 31      | 4 Erw Las (WAQF31)         | Suburban | N            | 11.5  | 14.0                                 | 11.5                                 | 11.9                                 | 12.6                                 |
| 36      | 15 Lower High Street (36)  | Roadside | N            | 38.2  | 32.8                                 | 28.7                                 | 26.5                                 | 23.5                                 |

Merthyr Tydfil County Borough Council

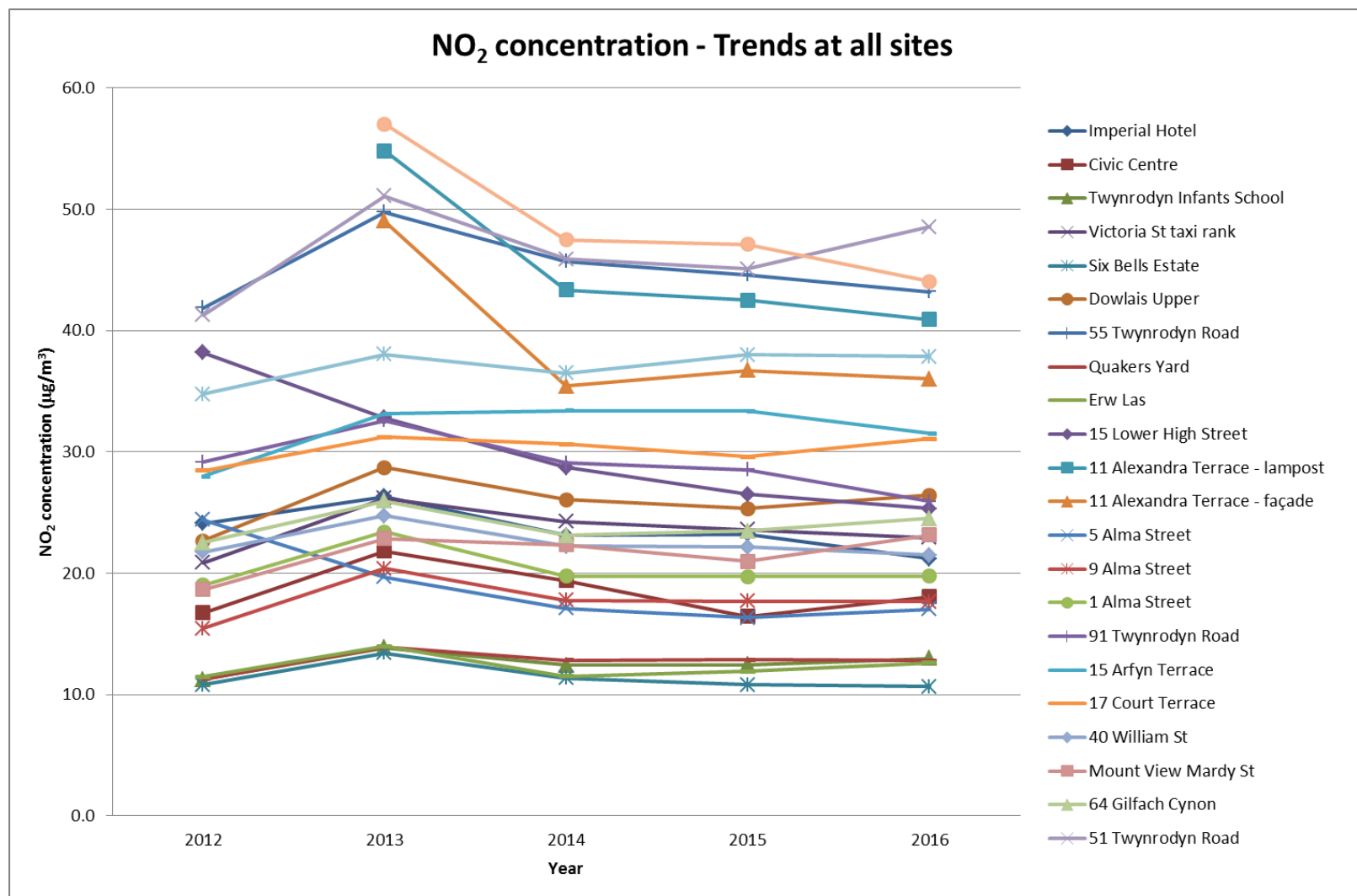
| Site ID | Site Type                            | Location | Within AQMA? | Annual Mean Concentration ( $\mu\text{g}/\text{m}^3$ ) - Adjusted for Bias <sup>a</sup> |                                      |                                      |                                      |                                      |
|---------|--------------------------------------|----------|--------------|---|--------------------------------------|--------------------------------------|--------------------------------------|--------------------------------------|
|         |                                      |          |              | 2012 (Bias Adjustment Factor = 0.69)  | 2013 (Bias Adjustment Factor = 0.85) | 2014 (Bias Adjustment Factor = 0.81) | 2015 (Bias Adjustment Factor = 0.79) | 2016 (Bias Adjustment Factor = 0.77) |
| 38      | 11 Alexandra Terrace (lamppost) (38) | Roadside | Y            |   | <b>54.8</b>                          | <b>43.3</b>                          | <b>42.5</b>                          | <b>40.9</b>                          |
| 39      | 11 Alexandra Terrace (facade) (39)   | Kerbside | Y            |   | <b>49.0</b>                          | 35.4                                 | 36.7                                 | 36.0                                 |
| 44      | 1 Alma Street (44)                   | Roadside | N            | 19.0  | 23.4                                 | 19.7                                 | 19.7                                 | 19.8                                 |
| 42      | 5 Alma Street (42)                   | Roadside | N            | 24.4  | 19.7                                 | 17.1                                 | 16.3                                 | 17.0                                 |
| 43      | 9 Alma Street (43)                   | Roadside | N            | 15.4  | 20.4                                 | 17.8                                 | 17.7                                 | 17.7                                 |

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

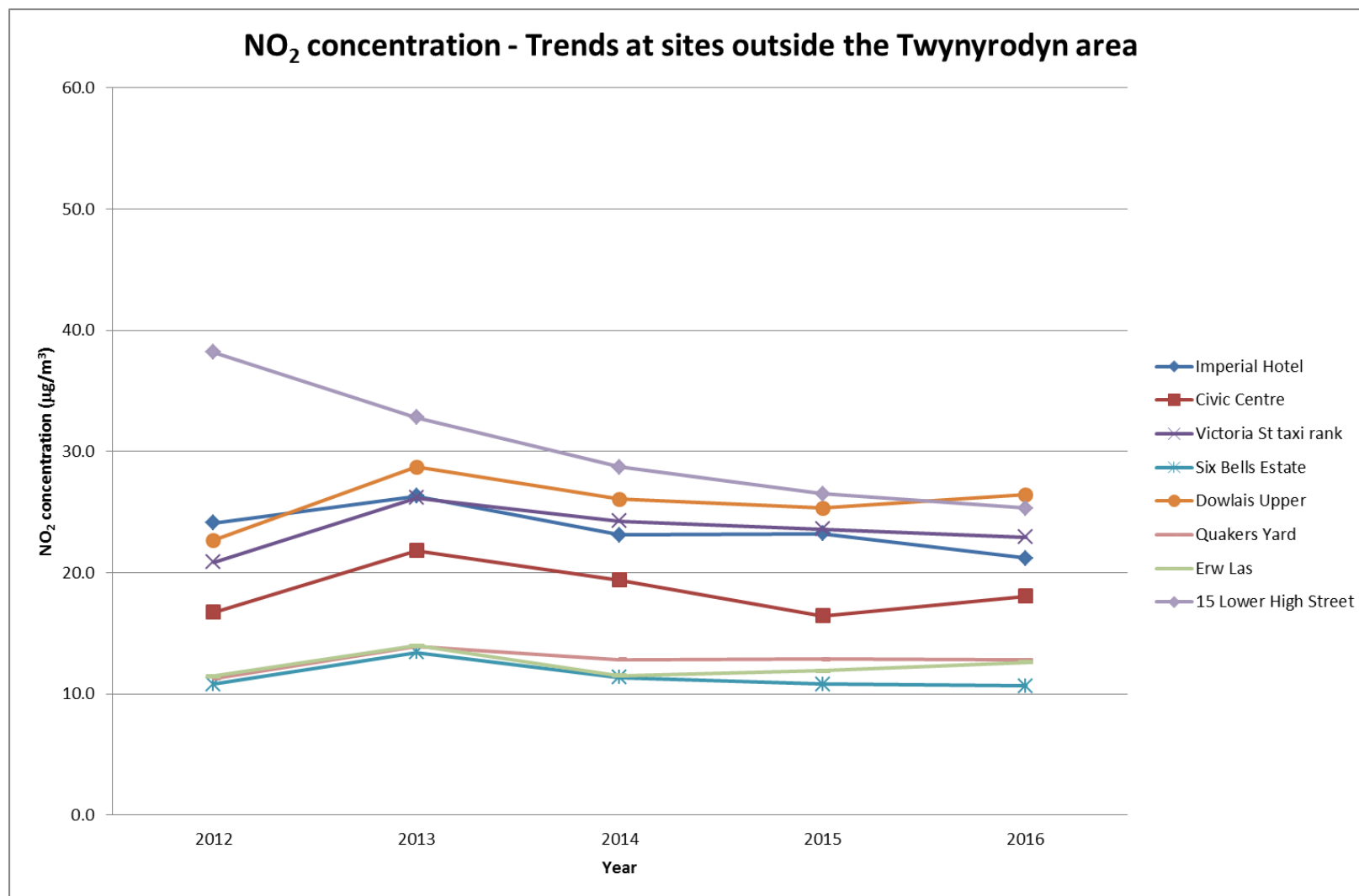
Underlined, annual mean > 60µg/m<sup>3</sup>, indicating a potential exceedence of the NO<sub>2</sub> hourly mean AQS objective

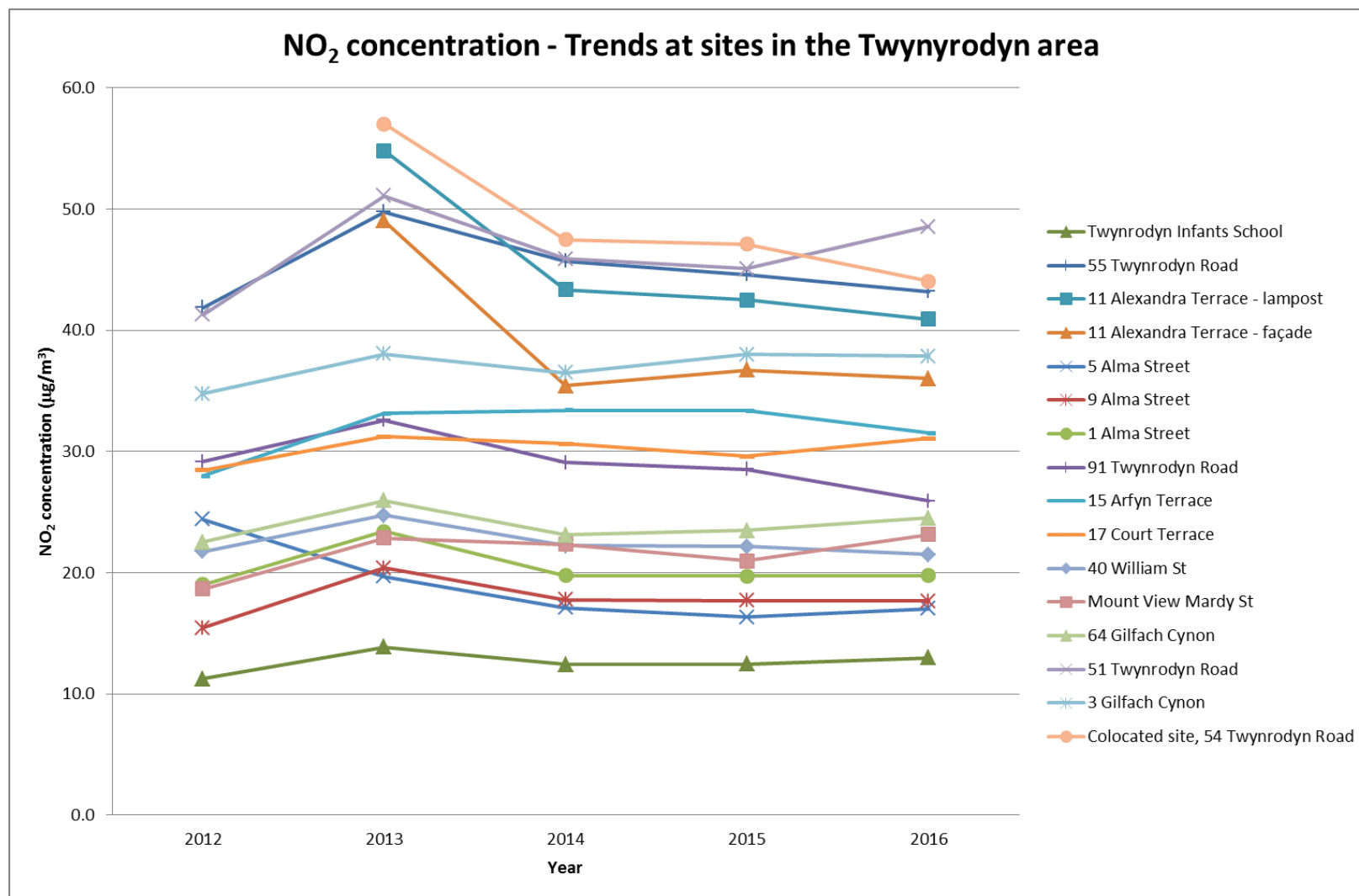
<sup>a</sup> Means should be “annualised” as in Boxes 7.9 and 7.10 of LAQM.TG16, if full calendar year data capture is less than 75%

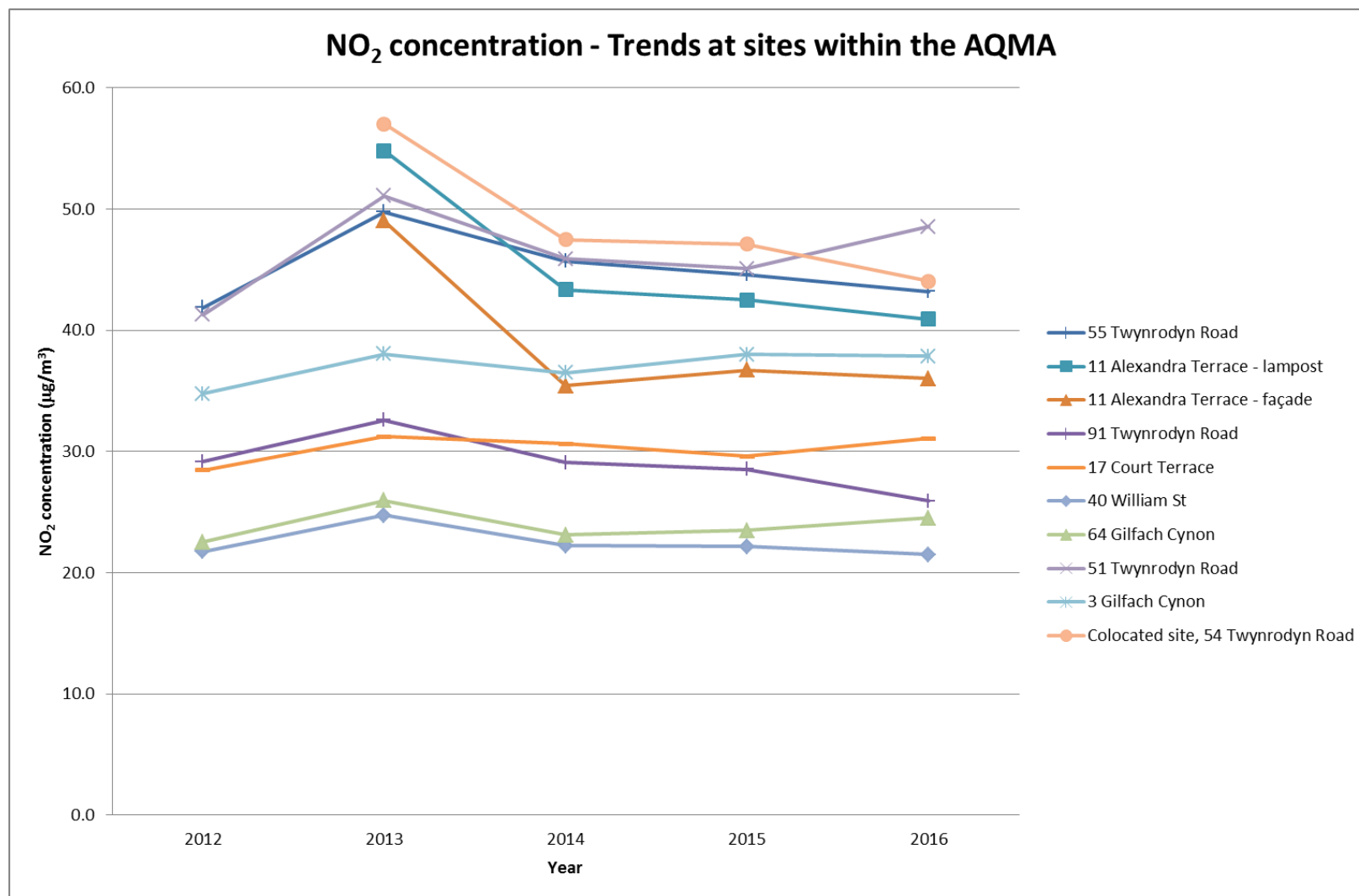
Figure 2.5 – Trends in Annual Mean Nitrogen Dioxide Concentrations Measured at Diffusion Tube Monitoring Sites











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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 area of exceedence may extend further East within the Twynyrodyn Road AQMA than previously considered. However there is no need to modify the AQMA as all tubes exceeding or within 10% of the AQO are within it.

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 most sites showing the highest results in the previous 5 years in 2013. It is worth noting that although NO<sub>2</sub> concentrations reduced from 2013 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 3 years in succession it indicates that the alterations to traffic flow have had an ongoing negative effect on air quality.

Results from 2016 show NO<sub>2</sub> concentrations at most sites along Twynyrodyn Road have decreased, probably as a result of gradual improvements in the vehicle fleet, or stayed approximately the same, compared to 2015. Any decrease has been marginal and not been sufficient for the AQO to be met in the area around 55 Twynyrodyn Road. 51 Twynyrodyn Road shows a marked increase in NO<sub>2</sub> concentration, the cause of which is unknown. It may be associated with drivers slowing in anticipation of traffic calming measures.

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

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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 no 1-hour mean concentrations above 200µg/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 TEOM data for PM<sub>10</sub> on the Welsh Air Quality Forum.

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 2016 % <sup>b</sup> | Confirm Gravimetric Equivalent (Y or N/A) | Annual Mean Concentration (µg/m <sup>3</sup> ) |                    |                    |                    |                   |
|------------------------|-----------|--------------|---|--|---|--|--------------------|--------------------|--------------------|-------------------|
|                        |           |              |   |  |   | 2012* <sup>c</sup>                             | 2013* <sup>c</sup> | 2014* <sup>c</sup> | 2015* <sup>c</sup> | 2016 <sup>c</sup> |
| APM1 Twynyrodyn School | Suburban  | Y            | 96.1  | 96.1                                   | Y   | 13.3   | 13.0               | 9.63               | 9.26               | 8.41              |

**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

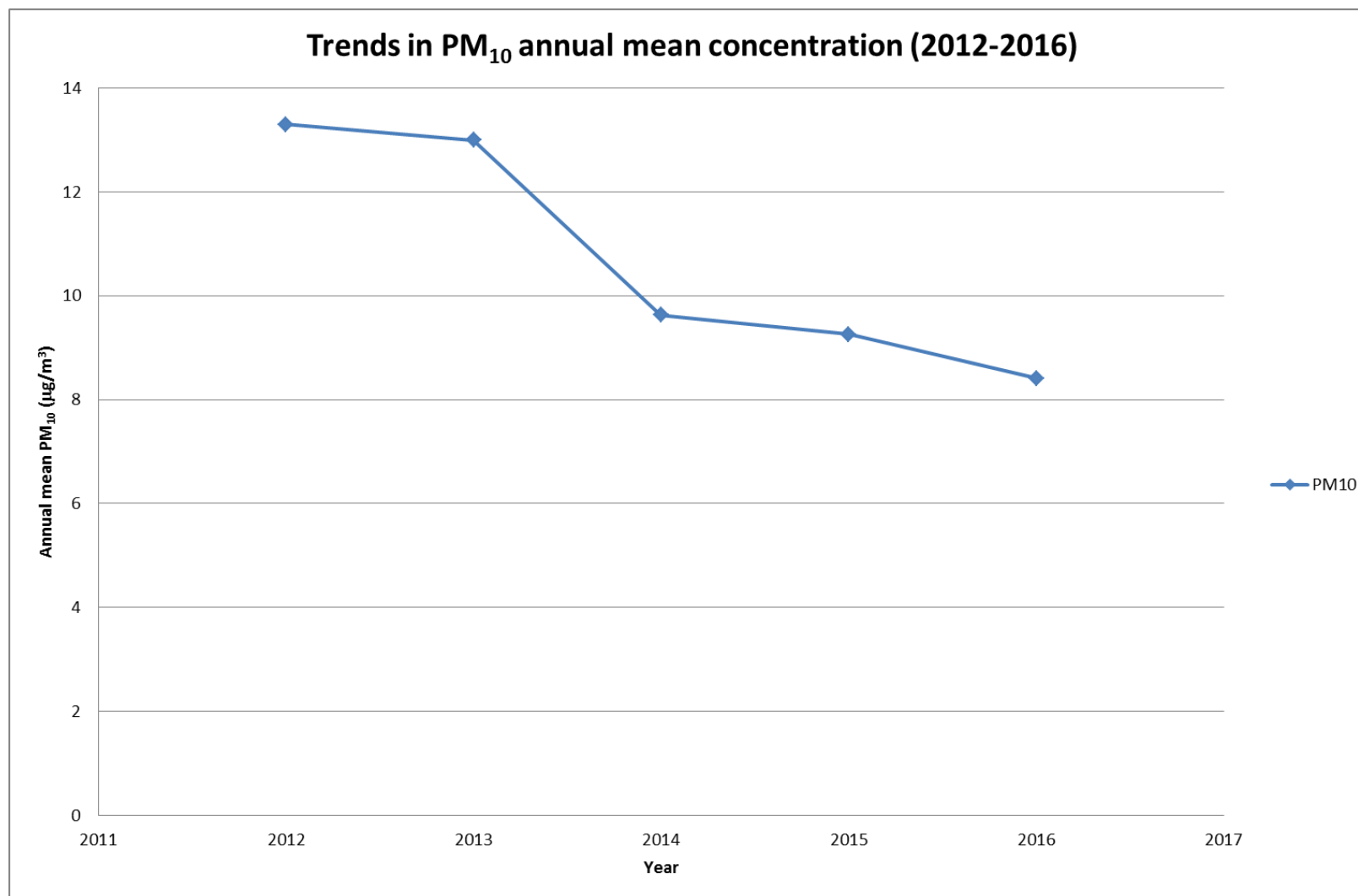
Figure 2.6 – Trends in Annual Mean PM<sub>10</sub> Concentrations



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 2016 % <sup>b</sup> | Confirm Gravimetric Equivalent (Y or N/A) | Number of Daily Means > 50µg/m <sup>3</sup> |                    |                    |                    |                   |
|---------------------------|-----------|--------------|---|--|---|---|--------------------|--------------------|--------------------|-------------------|
|                           |           |              |   |  |   | 2012* <sup>c</sup>                          | 2013* <sup>c</sup> | 2014* <sup>c</sup> | 2015* <sup>c</sup> | 2016 <sup>c</sup> |
| APM1<br>Twynyrodyn School | Suburban  | Y            | 98.1  | 98.1                                   | Y   | 2   | 0                  | 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)

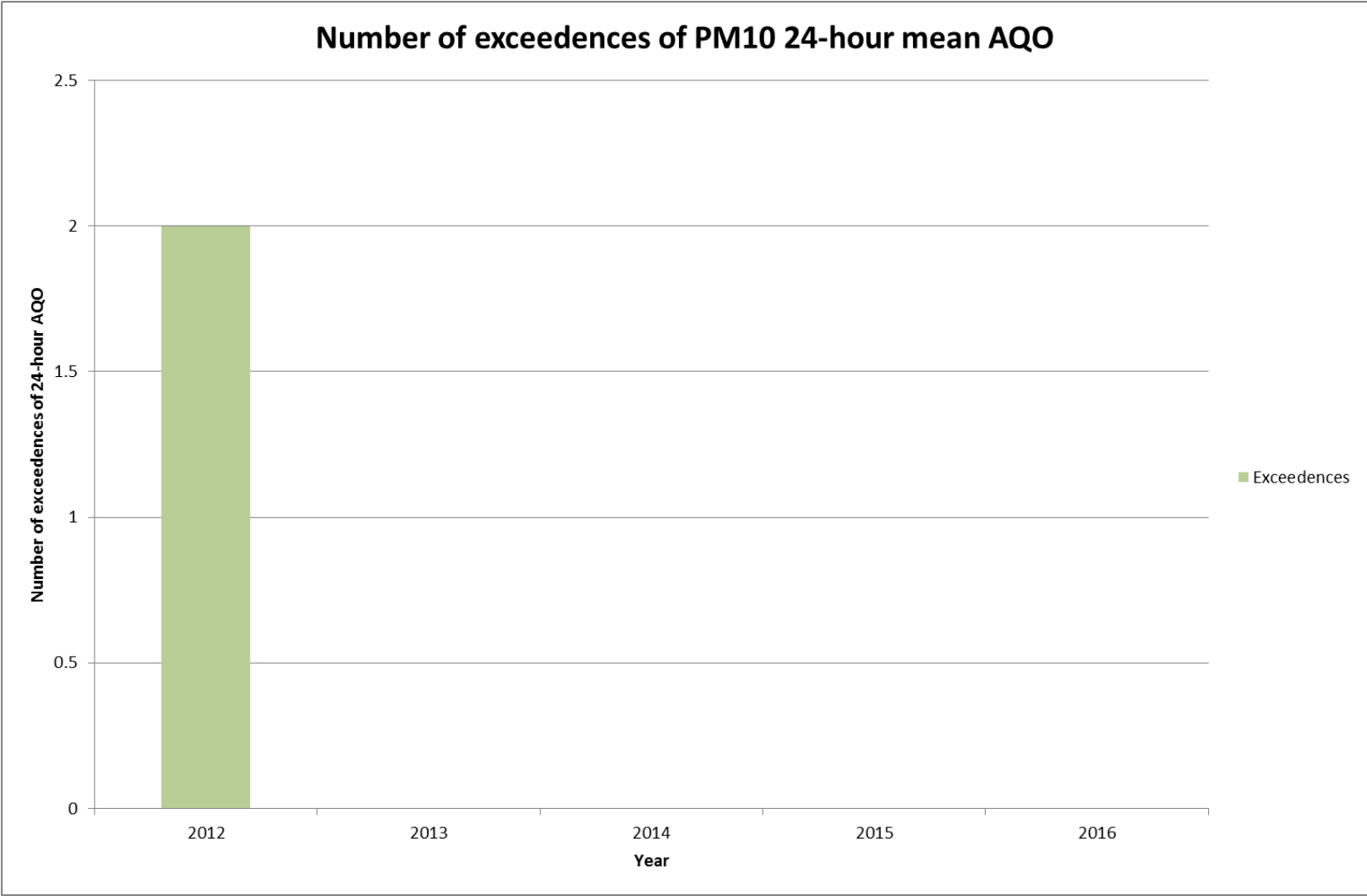
<sup>a</sup> i.e. data capture for the monitoring period, in cases where monitoring was only carried out for part of the year

<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 2.7 – Exceedences of PM10 24-hour mean AQO



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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**

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

Concentrations within the AQMA still exceed the annual mean AQO of 40µg/m<sup>3</sup> for NO<sub>2</sub> at the area around 55 Twynyrodyn 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, consult on 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, and may include diversionary traffic routes.

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

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

Construction on the Trago Mills development, Swansea Road is expected to be completed for it to open in Easter 2018. 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.

In April 2017 MTCBC opened a new diffusion tube location on Swansea Road to gather information on background levels, prior to the proposed 2018 opening. 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.

In February 2017, Wales Online reported that residents had expressed concerns about the impact the development would have on road traffic.

It is difficult to estimate the impact due to the lack of comparable developments in South Wales.

Start writing your supporting text on new/newly identified road traffic sources here.

### **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.

Merthyr Tydfil County Borough Council confirms that there are no new or newly identified

local developments which may have an impact on air quality within the Local Authority area.

Twynyrodyn Road and Trago Mills were considered in the previous progress report.

Twynyrodyn Road will be addressed through the action plan and Trago Mills through the NO2 diffusion tube network.

Merthyr Tydfil County Borough Council confirms that all the following have been considered:

- **Road traffic sources**
- **Other transport sources**
- **Industrial sources**
- **Commercial and domestic sources**
- **New developments with fugitive or uncontrolled sources.**

## 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 Twynyrodyn 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 consult on this and publish it 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. This is focussed around 51 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>.

The highest levels of NO<sub>2</sub> were previously found at 55 Twynyrodyn Road. The reason the highest levels have shifted downhill is not known. We speculate it may be as there is a speed cushion at 3 Gilfach Cynon and drivers are rapidly slowing uphill approaching it or rapidly increasing speed going downhill when they pass it, however there is insufficient information to test this assumption.

In the action plan, results from all sites within the AQMA as well as new sites opened up in nearby streets will be used for modelling to predict the effectiveness of traffic solutions.

MTCBC aim to develop an action plan, which 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 Spring 2018. For the purposes of further assessment have installed a 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.

In anticipation an additional 4 diffusion tubes have been located on side streets to the North of Twynyrodyn Road. They are on streets considered for a diversionary route taking some traffic off 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 2016 that indicates the need for any further detailed assessments. A detailed assessment of Twynyrodyn Road has already been completed prior to declaring the AQMA.

Twynyrodyn Road will continue to be assessed using a number of diffusion tubes. Prior to the Trago Mills development an additional diffusion tube location has been opened on Swansea Road, and this will be maintained and if necessary additional locations included once the development opens. 4 additional diffusion tubes have been installed on roads coming from Twynyrodyn Road, as these may be used as part of a diversion scheme. 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.

| Task                               | Provisional date      |
|------------------------------------|-----------------------|
| 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<br>Detailed Assessment of Air Quality      | AEA for MTCBC  | 2011        |
| Particulate Measurement at Twynrodyn Primary School<br>Monitoring Site - 2015 Data | AQ Data Services for<br>Miller Argent (South<br>Wales) Ltd | 2016        |
| Detailed Assessment of Air Quality at Twynrodyn Road,<br>Merthyr Tydfil            | AQC for MTCBC  | 2009        |
| Local Air Quality Management – Technical Guidance<br>(LAQM TG(16))                 | DEFRA  | 2016        |
| National Diffusion Tube Bias Adjustment Factor<br>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,<br>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: 03/17. 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. 30 co-location studies were undertaken in England and Wales in 2016, and an overall bias adjustment factor of 0.77 was obtained as shown in the abstract below.



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| National Diffusion Tube Bias Adjustment Factor Spreadsheet   |  |   |  |  | Spreadsheet Version Number: 03/17 V2  |   |  |  |                             |                                    |
|--|--|---|--|--|---|---|--|--|-----------------------------|------------------------------------|
| <p>Follow the steps below <b>in the correct order</b> to show the results of <b>relevant</b> co location studies</p> <p>Data only apply to tubes exposed monthly and are not suitable for correcting individual short term monitoring periods</p> <p>Whenever presenting adjusted data, you should state the adjustment factor used and the version of the spreadsheet</p> <p>This spreadsheet will be updated every few months; the factors may therefore be subject to change. This should not discourage their immediate use.</p> |  |   |  |  |   |   |  | <p>This spreadsheet will be updated at the end of June 2017</p> <p><a href="#">LAQM Helpdesk Website</a></p> |                             |                                    |
| The LAQM Helpdesk is operated on behalf of Defra and the Devolved Administrations by Bureau Veritas, in conjunction with contract partners AECOM and the National Physical Laboratory.   |  |   |  |  | Spreadsheet maintained by the National Physical Laboratory. Original compiled by Air Quality Consultants Ltd. |   |  |  |                             |                                    |
| Step 1:  |  | Step 2:   | Step 3:  | Step 4:  |   |   |  |  |                             |                                    |
| Select the Laboratory that Analyses Your Tubes from the Drop-Down List   |  | Select a Preparation Method from the Drop-Down List   | Select a Year from the Drop-Down List                  | Where there is only one study for a chosen combination, you should use the adjustment factor shown with caution. Where there is more than one study, use the overall factor <sup>3</sup> shown in blue at the foot of the final column.                            |   |   |  |  |                             |                                    |
| If a laboratory is not shown, we have no data for this laboratory.   |  | If the preparation method is not shown, we have no data for this method at this laboratory. | If a year is not shown, we have no data for this year. | If you have your own co-location study then see footnote <sup>4</sup> . If uncertain what to do then contact the Local Air Quality Management Helpdesk at <a href="mailto:LAQMHelpdesk@uk.bureauveritas.com">LAQMHelpdesk@uk.bureauveritas.com</a> or 0800 0327953 |   |   |  |  |                             |                                    |
| Analysed By <sup>1</sup>   | Method <sup>2</sup><br><small>To guide your selection, choose (All) from the pop-up list</small> | Year <sup>3</sup><br><small>To guide 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>6</sup> | Bias Adjustment Factor (A) (Cm/Dm) |
| ESG Didcot   | 50% TEA in acetone   | 2016  | UC   | Cardiff City Council   | 12  | 29  | 22   | 31.1%  | G                           | 0.76                               |
| ESG Didcot   | 50% TEA in acetone   | 2016  | R  | Dumfries and Galloway Council  | 12  | 36  | 31   | 15.6%  | G                           | 0.86                               |
| ESG Didcot   | 50% TEA in acetone   | 2016  | UI   | Stockton on Tees   | 10  | 23  | 18   | 26.7%  | P                           | 0.79                               |
| ESG Didcot   | 50% TEA in acetone   | 2016  | R  | Stockton on Tees   | 11  | 19  | 15   | 30.0%  | G                           | 0.77                               |
| ESG Didcot   | 50% TEA in acetone   | 2016  | R  | Vale of Glamorgan  | 10  | 40  | 28   | 43.7%  | G                           | 0.70                               |
| ESG Didcot   | 50% TEA in acetone   | 2016  | R  | Vale of White Horse District Council   | 11  | 33  | 29   | 15.3%  | G                           | 0.87                               |
| ESG Didcot   | 50% TEA in acetone   | 2016  | KS   | Leeds City Council   | 9   | 66  | 55   | 20.1%  | S                           | 0.83                               |
| ESG Didcot   | 50% TEA in acetone   | 2016  | KS   | Marleybone Road Intercomparison  | 12  | 104   | 79   | 30.8%  | G                           | 0.76                               |
| ESG Didcot   | 50% TEA in acetone   | 2016  | UB   | Slough Borough Council   | 12  | 43  | 40   | 6.7%   | G                           | 0.94                               |
| ESG Didcot   | 50% TEA in acetone   | 2016  | UB   | Slough Borough Council   | 12  | 34  | 29   | 19.6%  | G                           | 0.84                               |
| ESG Didcot   | 50% TEA in acetone   | 2016  | UC   | Slough Borough Council   | 11  | 38  | 30   | 26.5%  | G                           | 0.79                               |
| ESG Didcot   | 50% TEA in acetone   | 2016  | R  | Turnbridge Wells   | 12  | 57  | 44   | 30.6%  | G                           | 0.77                               |
| ESG Didcot   | 50% TEA in acetone   | 2016  | R  | Cambridge City Council   | 10  | 49  | 37   | 32.6%  | G                           | 0.75                               |
| ESG Didcot   | 50% TEA in acetone   | 2016  | R  | City of Wolverhampton Council  | 12  | 44  | 39   | 13.5%  | G                           | 0.88                               |
| ESG Didcot   | 50% TEA in acetone   | 2016  | R  | City of Wolverhampton Council  | 11  | 53  | 43   | 22.7%  | G                           | 0.81                               |
| ESG Didcot   | 50% TEA in acetone   | 2016  | B  | Gravesham Borough Council  | 12  | 31  | 23   | 33.5%  | G                           | 0.75                               |
| ESG Didcot   | 50% TEA in acetone   | 2016  | B  | Gravesham Borough Council  | 12  | 40  | 30   | 36.1%  | G                           | 0.73                               |
| ESG Didcot   | 50% TEA in acetone   | 2016  | R  | Horsham District Council   | 12  | 35  | 27   | 30.3%  | G                           | 0.77                               |
| ESG Didcot   | 50% TEA in acetone   | 2016  | R  | Horsham District Council   | 11  | 33  | 29   | 12.2%  | G                           | 0.89                               |
| ESG Didcot   | 50% TEA in acetone   | 2016  | R  | Horsham District Council   | 10  | 34  | 25   | 34.0%  | G                           | 0.75                               |
| ESG Didcot   | 50% TEA in acetone   | 2016  | B  | Maidstone Borough Council  | 11  | 15  | 12   | 25.3%  | G                           | 0.80                               |
| ESG Didcot   | 50% TEA in acetone   | 2016  | R  | Medway Council   | 12  | 35  | 26   | 36.6%  | G                           | 0.73                               |
| ESG Didcot   | 50% TEA in acetone   | 2016  | B  | Medway Council   | 9   | 21  | 11   | 88.1%  | G                           | 0.53                               |
| ESG Didcot   | 50% TEA in acetone   | 2016  | KS   | Suffolk Coastal DC   | 12  | 43  | 37   | 17.3%  | G                           | 0.85                               |
| ESG Didcot   | 50% TEA in acetone   | 2016  | UB   | City of York Council   | 9   | 22  | 16   | 38.6%  | G                           | 0.72                               |
| ESG Didcot   | 50% TEA in acetone   | 2016  | R  | City of York Council   | 12  | 39  | 29   | 34.1%  | G                           | 0.75                               |
| ESG Didcot   | 50% TEA in acetone   | 2016  | R  | City of York Council   | 12  | 33  | 25   | 33.4%  | G                           | 0.75                               |
| ESG Didcot   | 50% TEA in acetone   | 2016  | R  | City of York Council   | 12  | 41  | 27   | 51.2%  | G                           | 0.66                               |
| ESG Didcot   | 50% TEA in acetone   | 2016  | KS   | Leeds City Council   | 9   | 66  | 55   | 20.1%  | S                           | 0.83                               |
| ESG Didcot   | 50% TEA in acetone   | 2016  | R  | Leeds City Council   | 12  | 57  | 44   | 27.6%  | S                           | 0.78                               |
| ESG Didcot   | 50% TEA in acetone   | 2016  | Overall Factor <sup>3</sup> (30 studies)               |  |   |   |  | Use  |                             | 0.77                               |

### 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 2016 good precision was found in 26 out of 30 co-location studies. As such the precision for the diffusion tubes used in Merthyr Tydfil County Borough in 2016 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 2016 to January – February 2017, Environmental Services Group for 90% of testing achieved z-scores within this range. This is below 95%, the threshold for a laboratory to be considered satisfactory, however it is not substantially below, and as such the results are regarded as broadly 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. Performance may be affected after 2 years.

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 Enview2000 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.

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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 |
| 1       | Imperial Hotel (WAQF1)                       | 30.7  | 28.2     | 29.8     | 26.0     | 24.3     | 22.2     | 22.0     | 25.3     | 29.3     |           | 31.4      | 33.8      | 27.5        |
| 2       | Civic Centre (WAQF2)                         | 29.9  |          | 22.2     | 21.4     | 18.0     | 15.7     | 16.0     | 20.3     | 25.9     | 23.7      | 25.9      | 38.9      | 23.4        |
| 3       | Twynnyrodyn Community Primary School (WAQF3) | 20.4  | 17.1     | 16.6     |          |          | 8.8      | 9.8      | 11.2     | 17.5     | 19.9      | 25.1      | 29.2      | 16.9        |
| 15      | Victoria Street (WAQF15)                     | 32.9  | 32.7     | 31.3     | 28.4     | 27.3     | 20.1     | 21.2     | 21.3     | 29.8     | 36.3      |           | 46.0      | 29.8        |
| 16      | Six Bells Estate (WAQF16)                    | 16.0  | 10.4     | 13.6     | 12.9     | 9.5      | 5.7      | 6.4      | 7.7      | 13.9     | 20.6      | 20.8      | 28.4      | 13.8        |
| 25      | Upper Dowlais (WAQF25)                       | 29.5  |          | 36.6     | 37.8     | 32.1     | 23.1     | 24.4     | 28.2     | 31.2     | 41.5      | 42.9      | 50.2      | 34.3        |
| 29      | 55 Twynnyrodyn Road (WAQF29)                 | 42.6  | 59.8     | 61.7     |          |          | 51.0     | 53.4     | 53.8     | 59.4     | 67.8      | 73.1      | 84.6      | 56.1        |
| 29J     | 55 Twynnyrodyn Road (collocated) (29J)       | 46.2  | 60.5     | 62.5     | 61.1     | 58.1     | 47.8     | 52.6     | 46.8     | 52.2     | 67.5      | 49.3      | 81.8      | 57.2        |
| 29A     | 91 Twynnyrodyn Road (29A)                    | 39.0  | 36.6     |          |          | 31.3     | 27.4     | 23.0     | 30.3     | 36.3     | 39.2      | 44.4      | 52.9      | 33.7        |
| 29B     | 15 Arfryn Terrace (29B)                      | 43.3  | 38.6     | 40.5     | 38.5     | 34.9     | 32.4     | 35.4     | 36.2     | 45.6     | 40.5      | 45.9      | 59.3      | 40.9        |
| 29D     | 17 Court Terrace (29D)                       | 37.5  | 41.0     | 42.2     | 45.0     | 44.9     | 24.9     | 27.6     | 32.4     | 26.3     | 25.5      | 38.2      | 43.3      | 27.9        |
| 29E     | 40 William Street (29E)                      | 32.3  | 32.1     | 20.6     | 26.5     | 23.5     | 21.0     | 22.5     | 23.2     | 26.3     | 25.5      | 38.2      | 43.3      | 21.5        |

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|     |  |      |      |      |      |      |      |      |      |      |      |      |      |      |
|-----|--|------|------|------|------|------|------|------|------|------|------|------|------|------|
| 29F | Mount View<br>Mardy Street<br>(29F)        | 34.6 | 28.9 | 31.8 | 25.5 | 28.4 | 16.8 | 19.0 | 21.9 | 33.1 | 35.1 | 36.1 | 49.6 | 23.2 |
| 29G | 64 Gilfach Cynon<br>(29G)                  | 31.8 | 28.2 | 33.2 | 33.9 | 25.8 | 20.3 | 23.0 | 25.3 | 29.7 | 39.9 | 42.9 | 47.8 | 24.5 |
| 29H | 51 Twynyrodyn<br>Road (29H)                | 56.8 | 63.5 | 69.8 | 70.3 | 64.7 | 45.7 | 49.6 | 55.1 | 58.3 | 70.0 | 70.1 | 82.3 | 48.5 |
| 29I | 3 Gilfach Cynon<br>(29I)                   | 49.9 | 49.3 | 53.2 | 52.3 | 53.4 | 36.5 | 35.7 | 43.9 | 44.0 | 59.0 | 55.3 | 57.1 | 37.8 |
| 30  | Quakers Yard<br>(WAQF30)                   | 17.0 | 17.0 | 16.2 | 15.0 | 11.8 | 10.5 | 11.5 | 14.3 | 17.5 | 18.5 | 23.4 | 27.0 | 12.8 |
| 31  | 4 Erw Las<br>(WAQF31)                      | 19.4 | 17.2 | 15.3 | 14.3 | 12.1 | 9.5  | 10.6 | 7.7  | 20.3 | 21.2 | 22.2 | 26.7 | 12.6 |
| 36  | 15 Lower High<br>Street (36)               | 32.9 | 36.6 | 38.4 |      |      | 25.2 | 23.6 | 29.7 | 37.4 | 36.0 | 46.1 | 45.8 | 32.9 |
| 38  | 11 Alexandra<br>Terrace<br>(lamppost) (38) | 52.6 | 50.3 | 57.7 | 56.3 | 53.9 | 40.4 | 45.2 | 41.7 | 48.8 | 54.9 | 67.9 | 67.9 | 40.9 |
| 39  | 11 Alexandra<br>Terrace (facade)<br>(39)   | 42.5 | 47.2 | 51.6 | 50.2 | 51.3 | 35.7 | 37.6 | 41.4 | 42.3 | 40.6 | 55.5 | 65.3 | 36.0 |
| 44  | 1 Alma Street<br>(44)                      | 27.7 | 28.9 | 24.8 | 21.9 | 22.9 | 16.8 | 19.2 | 20.8 | 26.8 | 25.2 | 31.9 | 40.9 | 19.8 |
| 42  | 5 Alma Street<br>(42)                      | 22.7 | 23.7 | 23.5 | 20.3 | 17.0 | 13.2 | 15.3 | 17.7 | 23.5 | 20.0 | 30.4 | 38.2 | 17.0 |
| 43  | 9 Alma Street<br>(43)                      | 30.1 | 25.3 | 27.5 | 20.8 | 16.3 | 14.1 | 14.3 | 17.4 | 23.6 | 15.1 | 30.1 | 40.7 | 22.9 |

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

The data is available on request.