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)

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Executive Summary

Crynodeb Gweithredol

Mae'r adroddiad hwn yn cyflawni anghenion y broses Rheoli Ansawdd Aer yn Lleol (RhAALl) 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 RhAALl 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_2 , dynodwyd AAA (Amcan Ansawdd Aer) yn ardal Heol Twynyrodyn ar 30 Ionawr 2017 a gwnaethpwyd datganiad ARhAA. Ym 2016, dynododd tiwbiau tryledia fod lefelau NO_2 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_2 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_2 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 tryledia d 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 Twynyrodyn drwy ostegu traffig a chynnig llwybrau amgen. Mae llwybr amgen posib, i'r ochr Ogleddol o Heol Twynyrodyn yn cael ei ystyried a gan ragweld hyn, mae 4 safle ychwanegol wedi cael eu creu ar gyfer gosod tiwbiau tryledia d.

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_2 yn cydymffurfio â chanllawiau. Mae CBSMT yn bwriadu cadarnhau hyn drwy ddefnyddio tiwbiau tryledia d. 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_2. Agorwyd tiwb tryledia d 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 Twynyrodyn Road by traffic calming and alternative routes. A potential alternative route to the North side of Twynyrodyn 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_2 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_2. A diffusion tube was opened on Swansea Road in April 2017 to monitor background NO_2 for comparison when the development opens in early 2018.

2017 i fonitro NO_2 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.

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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^3	Milligrams of the pollutant per cubic metre of air
$\mu g/m^3$	Micrograms of the pollutant per cubic metre of air
MTCBC	Merthyr Tydfil County Borough Council
NO	Nitric oxide
NO_2	Nitrogen dioxide
NOx	Nitrogen oxides
O_3	Ozone
PM_{10}	Particles with diameter less than 10µm
$PM_{2.5}$	Particles with diameter less than 2.5µm
QA/QC	Quality Assurance / Quality Control
SO_2	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

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

Although there are no longer any significant industrial sources in the Borough traffic has increased, particularly on the Twynyrodyn Road link. This is a result of new residential developments on the outskirts of the town towards the A4060 combined with the opening and expansion of retail and leisure facilities in the town 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 micrograms per cubic metre μg/m^3 (milligrammes per cubic metre, mg/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 μg/m^3	Running annual mean	31.12.2003
	5.00 μg/m^3	Annual mean	31.12.2011
1,3-butadiene	2.25 μg/m^3	Running annual mean	31.12.2003
Carbon monoxide	10 mg/m^3	Running 8-hour mean	31.12.2003
Lead	0.50 μg/m^3	Annual mean	31.12.2004
	0.25 μg/m^3	Annual mean	31.12.2008
Nitrogen dioxide	200 μg/m^3 not to be exceeded more than 18 times a year	1-hour mean	31.12.2005
	40 μg/m^3	Annual mean	31.12.2005
Particulate matter (PM_{10}) (gravimetric)	50 μg/m^3, not to be exceeded more than 35 times a year	24-hour mean	31.12.2004
	40 μg/m^3	Annual mean	31.12.2004
Sulphur dioxide	350 μg/m^3, not to be exceeded more than 24 times a year	1-hour mean	31.12.2004
	125 μg/m^3, not to be exceeded more than 3 times a year	24-hour mean	31.12.2004
	266 μg/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_{10}, SO_2, and NO_2 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_{10}, SO_2 and NO_2 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_2 levels had increased but within the annual air quality objective of 40 $\mu g/m^3$ at all locations. However, levels at WAQF 29, 55 Twynyrodyn Road, were within 10% of the limit and the monitoring network was expanded in this area.

- The Progress Report 2008 found NO_2 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_2 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_2 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_2 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_2 monitored levels and no exceedences of the annual air quality objective. As a result, although the detailed assessment of NO_2 levels around site 29 (undertaken in 2009) had suggested an AQMA should be declared, this was deferred.
- The Progress Report 2011 found NO_2 levels had increased within the objective, however at WAQF 29, 55 Twynyrodyn Road, an unusually marked exceedance was identified. It was considered necessary to further increase the number of monitoring sites on Twynyrodyn 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_2 and SO_2 levels in the vicinity. It concluded that emissions will not

result in any exceedences of the objectives for either pollutant unless the large, on-site emergency diesel generators were to be used for extended periods.

Updating and Screening Assessment and Progress Reports – 2012 - 2014

- Monitored PM_{10} 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_2 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_2 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_2 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_2 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_2 in the defined area was therefore required.

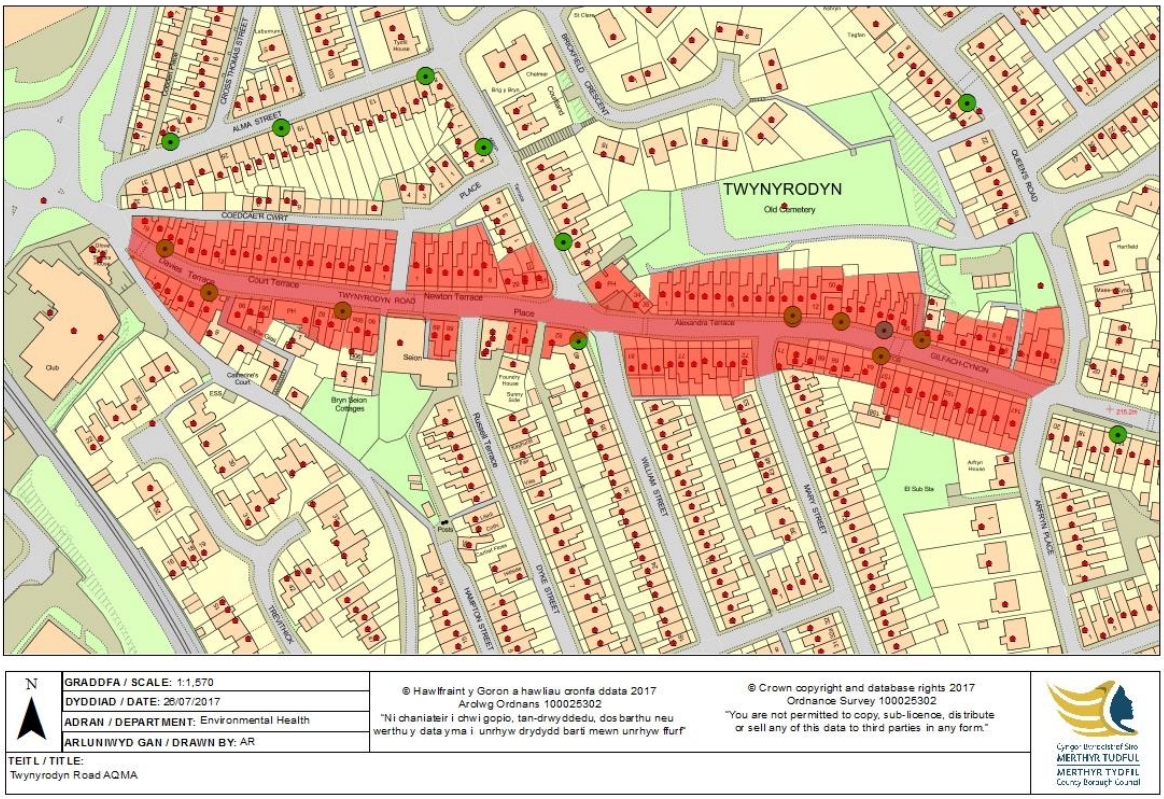
Detailed assessment 2015

- Elevated NO_2 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_2 concentrations. As NO_2 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 30th January 2017, which is mapped in Figure 1.1.

Updating and Screening Assessment and Progress Reports – 2015 – 2017

- Monitored PM_{10} 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_2 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_{10} and $PM_{2.5}$)

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, $PM_{10,}$ and ultra-fine particulates, $PM_{2.5,}$ at a site in the locality since 2007. The air quality monitoring system is intended to determine ambient PM_{10} and $PM_{2.5}$ concentrations and detect any increases in PM_{10} and $PM_{2.5}$ resulting from this operation.

Two Tapered Elemental Oscillating Microbalance (TEOM) analysers provide continuous measurements of PM_{10} and $PM_{2.5}$. Data is averaged and stored every 15 minutes, then periodically downloaded to a data management system for later analysis. Only data on PM_{10} in 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_{10} and $PM_{2.5}$ 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 Twynyrodyn 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

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_2 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 exceedence 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_2. Comparison studies with chemiluminescent monitors show a correlation, however it under-reads NO_2. 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_2 exceeds AQO.
- Colocation with existing NO_2 diffusion tube.

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

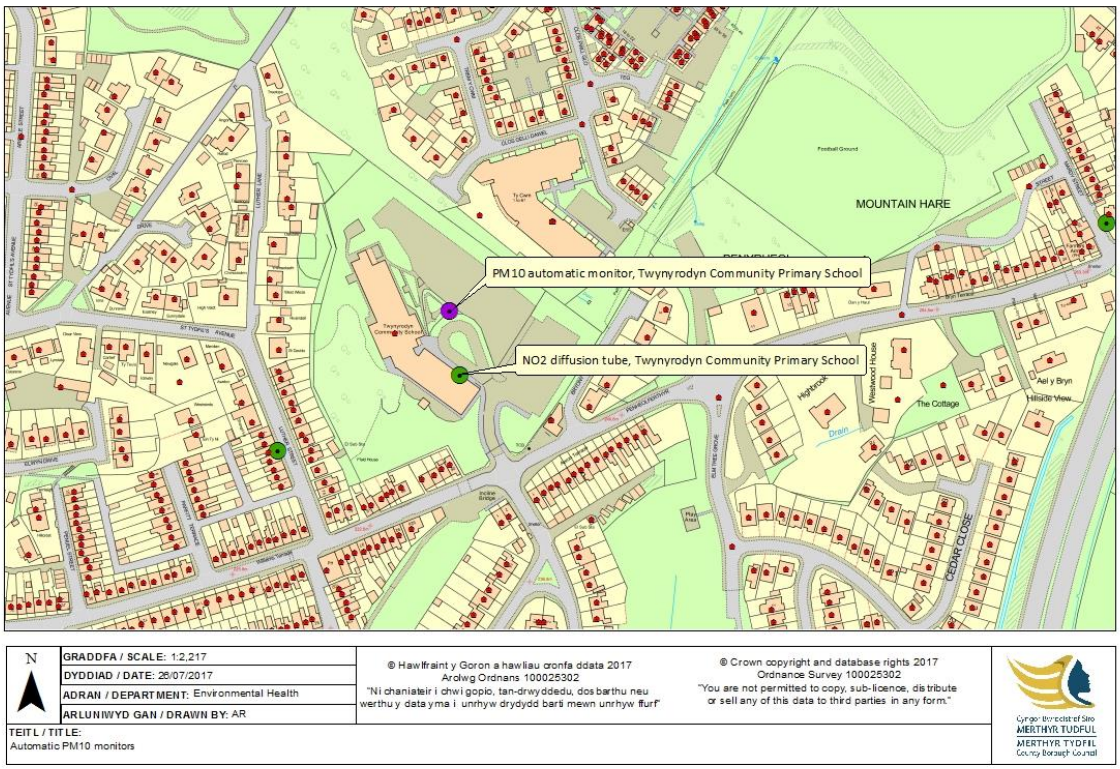


Figure 2.2 - Maps of Automatic Monitoring Sites – ECC monitor (dark green) and collocated diffusion tubes (light green)

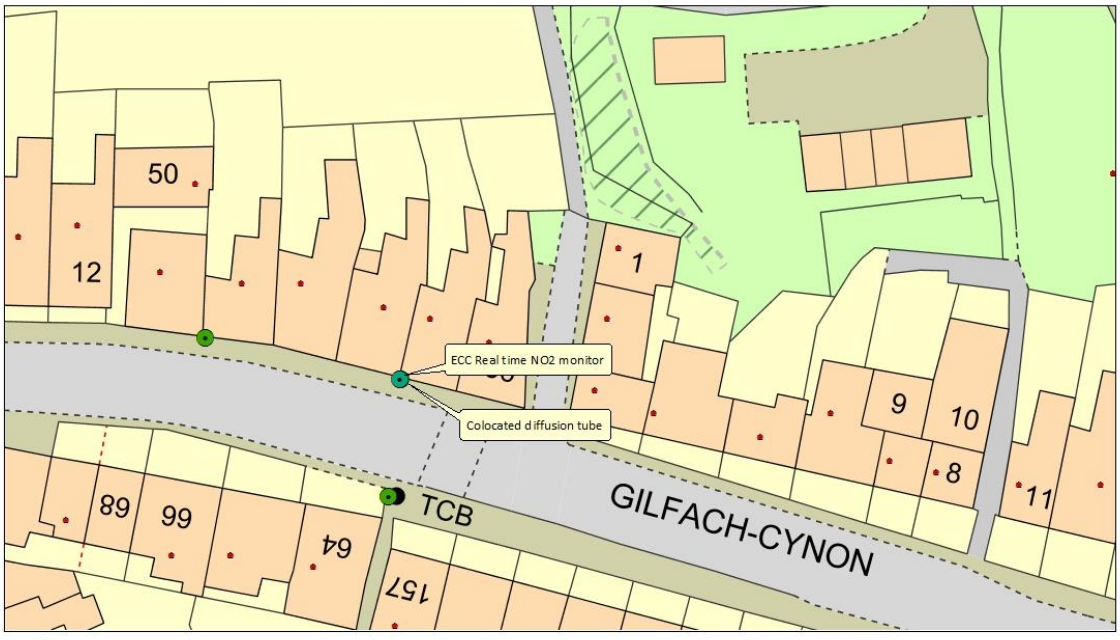


Table 2.1 – Details of Automatic Monitoring Sites

Site Name	Site Type	X OS Grid Reference	Y OS Grid Reference	Inlet Height (m)	Pollutants Monitored	In AQMA?	Monitoring Technique	Relevant Exposure? (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?
APM1 Twynyrodyn School	Suburban	305821	206008	2.43	PM_{10} $PM_{2.5}$	N	TEOM	Y (0m)	N/A	N
ECC	Kerbside	305416	205867	2.75	NO_2	Y	ECC	Y (1m)	N/A	Y

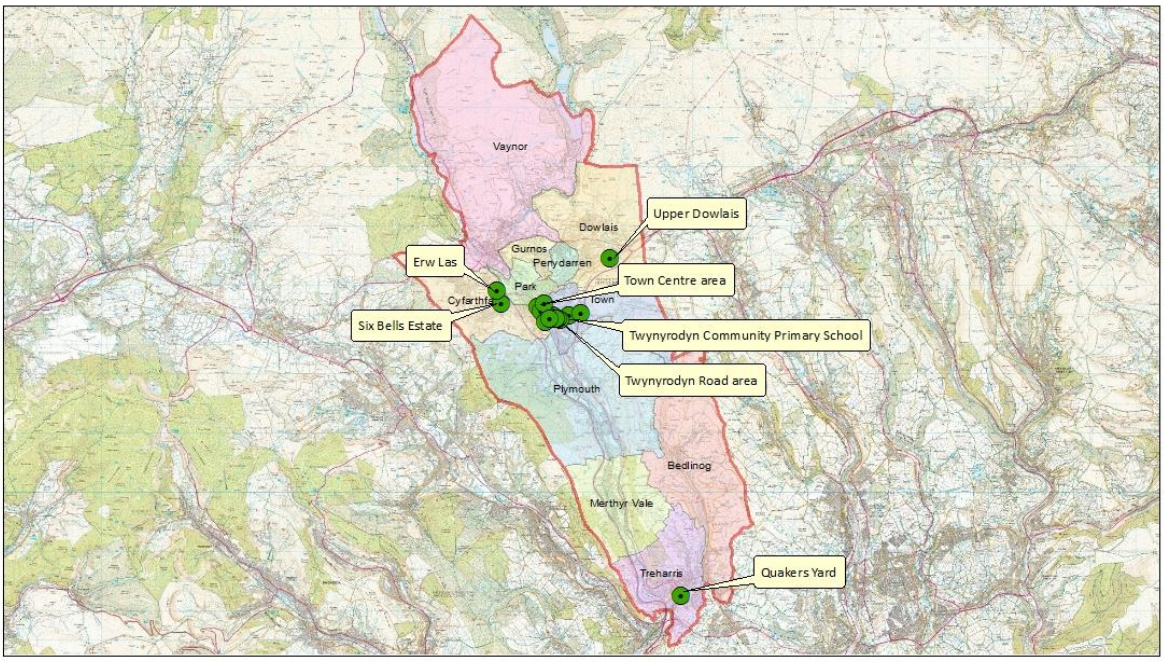
2.1.2 Non-Automatic Monitoring Sites

MTCBC has operated a network of NO_2 diffusion tube sites across the Borough for a number of years. The majority are located in areas where NO_2 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_2 levels on particular road links.

Sites located in areas where it is considered possible that NO_2 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_2 levels found on one section of it. These sites reveal the general trend of NO_2 levels along the link and will highlight deviations from the trend produced by the MTCBC's actions to reduce the NO_2 levels. In April 2017 a number of new sites were opened to monitor NO2 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.

Figure 2.3 – Maps of Non-Automatic Monitoring Sites



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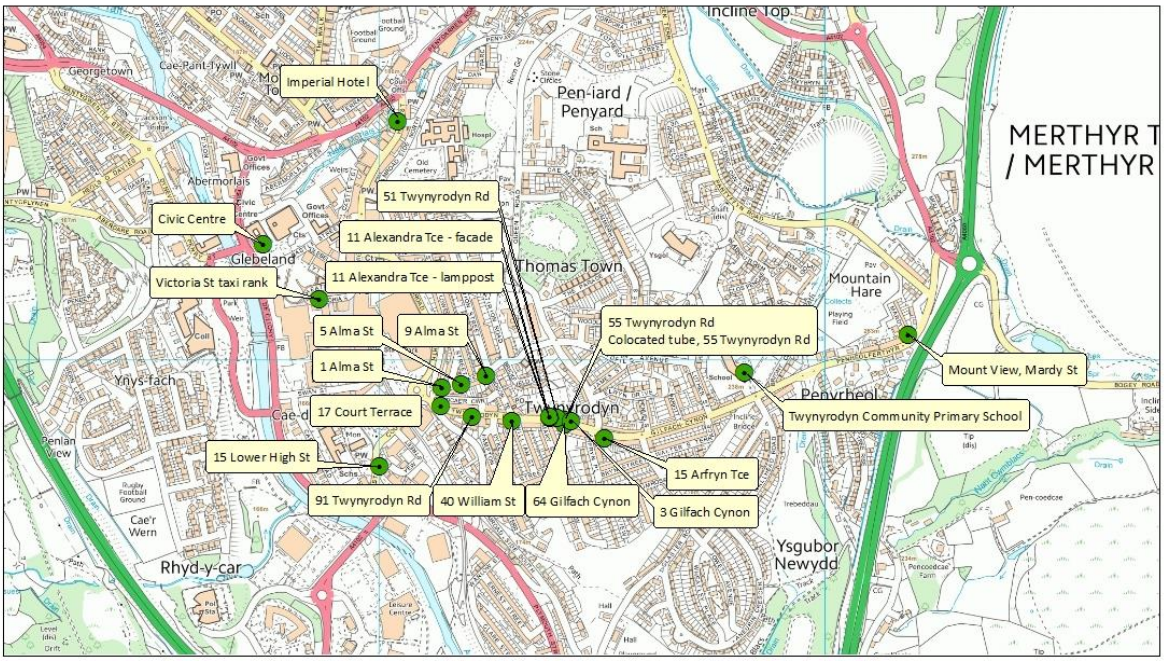
ADRAN / DEPARTMENT: Environmental Health	
ARLUNIWYD GAN / DRAWN BY: AR	
TEITL / TITLE: Diffusion tube network - District	



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ADRAN / DEPARTMENT: Environmental Health	
ARLUNIWYD GAN / DRAWN BY: AR	
TEITL / TITLE: Diffusion tube network - Town Centre and Twynyrodyn Road	

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	DYDDIAD / DATE: 27/07/2017		
	ADRAN / DEPARTMENT: Environmental Health		
	ARLUNIWYD GAN / DRAWN BY: AR		
TEITL / TITLE: Diffusion tube network - Twynyrodyn AQMA			

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_2	N	N	Y (2.6m)	2.3m	Y
2	Civic Centre (WAQF2)	Urban background	304743	206261	1.9	NO_2	N	N	Y (135.0m)	42m	N
3	Twynyrodyn Community Primary School (WAQF3)	Suburban	305832	205941	2.1	NO_2	N	N	Y (56.0m)	57m	N

Site ID	Site Name	Site Type	X OS Grid Reference	Y OS Grid Reference	Site Height (m)	Pollutants Monitored	In AQMA?	Is Monitoring Co-located with a Continuous Analyser (Y/N)	Relevant Exposure? (Y/N with distance (m) from monitoring site to relevant exposure)	Distance to Kerb of Nearest Road (m) (N/A if not applicable)	Does this Location Represent Worst-Case Exposure?
15	Victoria Street (WAQF15)	Urban Centre	304866	206137	2.4	NO_2	N	N	Y (0.15m)	2.6m	Y
16	Six Bells Estate (WAQF16)	Suburban	303525	206388	2.0	NO_2	N	N	Y(0.15m)	6.6m	N
25	Upper Dowlais (WAQF25)	Roadside	307171	207915	2.3	NO_2	N	N	Y (0.15m)	1.5m	Y
29	55 Twynyrodyn Road (WAQF29)	Roadside	305410	205869	2.2	NO_2	Y	Y	Y (0.15m)	1.6m	Y

Site ID	Site Name	Site Type	X OS Grid Reference	Y OS Grid Reference	Site Height (m)	Pollutants Monitored	In AQMA?	Is Monitoring Co-located with a Continuous Analyser (Y/N)	Relevant Exposure? (Y/N with distance (m) from monitoring site to relevant exposure)	Distance to Kerb of Nearest Road (m) (N/A if not applicable)	Does this Location Represent Worst-Case Exposure?
29J	55 Twynyrodyn Road (collocated) (29J)	Roadside	305410	205869	2.6	NO_2	Y	Y	Y (0.15m)	1.6m	Y
29A	91 Twynyrodyn Road (29A)	Roadside	305217	205880	2.4	NO_2	Y	N	Y (.15m)	2.2m	Y
29B	15 Arfryn Terrace (29B)	Roadside	305147	205906	2.1	NO_2	Y	N	Y (0.15m)	4.85m	Y
29D	17 Court Terrace (29D)	Roadside	305149	205906	2.2	NO_2	Y	N	Y (0.15m)	1.3m	Y

Site ID	Site Name	Site Type	X OS Grid Reference	Y OS Grid Reference	Site Height (m)	Pollutants Monitored	In AQMA?	Is Monitoring Co-located with a Continuous Analyser (Y/N)	Relevant Exposure? (Y/N with distance (m) from monitoring site to relevant exposure)	Distance to Kerb of Nearest Road (m) (N/A if not applicable)	Does this Location Represent Worst-Case Exposure?
29E	40 William Street (29E)	Roadside	305316	205872	2.0	NO_2	Y	N	Y (0.15m)	5.3m	Y
29F	Mount View Mardy Street (29F)	Roadside	305521	205836	2.1	NO_2	N	N	Y (0.15m)	3.3m	Y
29G	64 Gilfach Cynon (29G)	Roadside	305415	205856	2.2	NO_2	Y	N	Y (2.0m)	1.5m	Y
29H	51 Twynyrodyn Road (29H)	Roadside	305431	205863	2.2	NO_2	Y	N	Y (0.15m)	1.55m	N
29I	3 Gilfach Cynon (29I)	Roadside	305431	205863	2.3	NO_2	Y	N	Y (0.15m)	2.2m	Y

Site ID	Site Name	Site Type	X OS Grid Reference	Y OS Grid Reference	Site Height (m)	Pollutants Monitored	In AQMA?	Is Monitoring Co-located with a Continuous Analyser (Y/N)	Relevant Exposure? (Y/N with distance (m) from monitoring site to relevant exposure)	Distance to Kerb of Nearest Road (m) (N/A if not applicable)	Does this Location Represent Worst-Case Exposure?
30	Quakers Yard (WAQF30)	Suburban	309573	196518	1.9	NO_2	N	N	Y (0.15m)	4.0m	N
31	4 Erw Las (WAQF31)	Suburban	303360	206822	2.0	NO_2	N	N	Y (0.15m)	37.0m	N
36	15 Lower High Street (36)	Roadside	305001	205763	2.3	NO_2	N	N	Y (0.15m)	3.6m	Y
38	11 Alexandra Terrace (lamppost) (38)	Roadside	305382	205872	3.0	NO_2	Y	N	Y(1.6m)	1.45m	Y

Site ID	Site Name	Site Type	X OS Grid Reference	Y OS Grid Reference	Site Height (m)	Pollutants Monitored	In AQMA?	Is Monitoring Co-located with a Continuous Analyser (Y/N)	Relevant Exposure? (Y/N with distance (m) from monitoring site to relevant exposure)	Distance to Kerb of Nearest Road (m) (N/A if not applicable)	Does this Location Represent Worst-Case Exposure?
39	11 Alexandra Terrace (facade) (39)	Kerbside	305382	205873	1.5	NO_2	Y	N	Y(0.15m)	2.9m	Y
44	1 Alma Street (44)	Roadside	305141	205940	2.3	NO_2	N	N	Y(0.15m)	1.2m	Y
42	5 Alma Street (42)	Roadside	305181	205954	2.3	NO_2	N	N	Y(0.15m)	1.3m	Y
43	9 Alma Street (43)	Roadside	305240	205965	2.3	NO_2	N	N	Y(0.15m)	1.45m	Y

2.2 Comparison of Monitoring Results with Air Quality Objectives

2.2.1 Nitrogen Dioxide (NO_2)

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 in 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_2: Comparison with Annual Mean Objective

Site ID	Site Type	Within AQMA?	Valid Data Capture for Monitoring Period % [a]	Valid Data Capture 2016 % [b]	Annual Mean Concentration (µg/m^3)				
					2012* [c]	2013* [c]	2014* [c]	2015* [c]	2016 [c]
ECC	Roadside	Y		57			**52.3 (158.4)**	**46.1**	39.7

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

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

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

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

* Annual mean concentrations for previous years are optional

Table 2.4 – Results of Automatic Monitoring for NO_2: Comparison with 1-hour Mean Objective

Site ID	Site Type	Within AQMA?	Valid Data Capture for Monitoring Period % [a]	Valid Data Capture 2016 % [b]	Number of Hourly Means > 200µg/m^3				
					2012* [c]	2013* [c]	2014* [c]	2015* [c]	2016 [c]
ECC	Roadside	Y		59			1	0	0

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

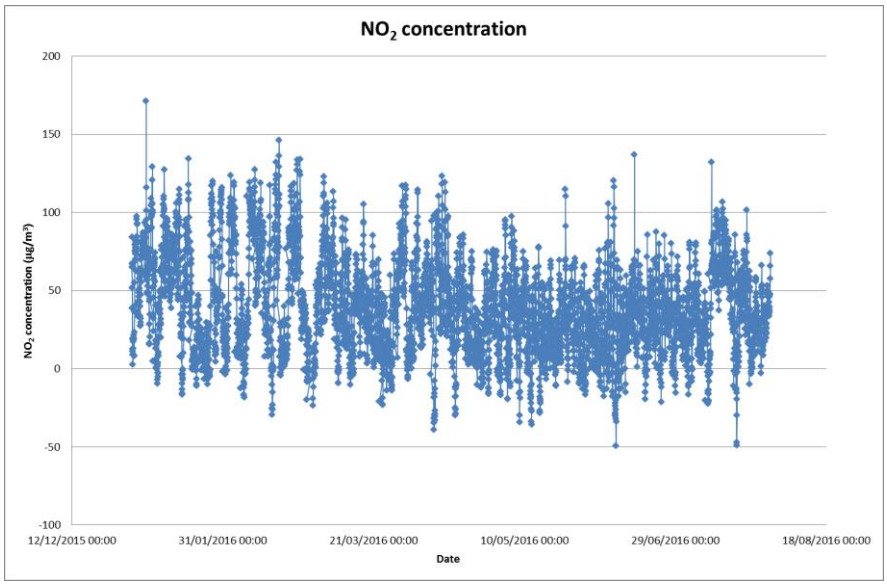
[a] i.e. data capture for the monitoring period, in cases where monitoring was only carried out for part of the year

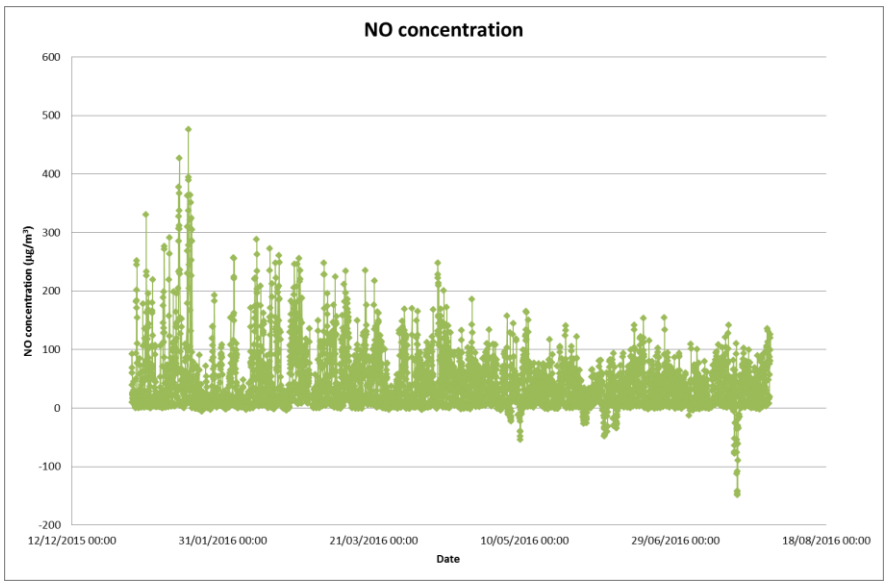
[b] i.e. data capture for the full calendar year (e.g. if monitoring was carried out for six months the maximum data capture for the full calendar year would be 50%)

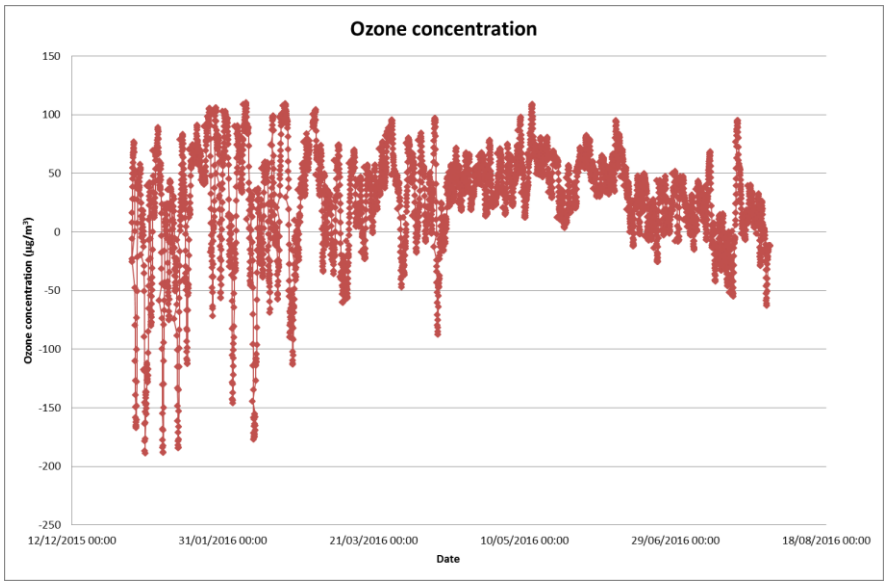
[c] If the data capture for full calendar year is less than 85%, include the 99.8th percentile of hourly means in brackets

* Number of exceedences for previous years is optional

Figure 2.4 – Comparison of ECC measurements of NO_2, NO and Ozone







As shown by Figure 2.4, there are a number of negative gas concentrations recorded by the ECC. It measures NO, Ozone and NO_2. 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_2 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_2 is in excess of 39.7$\mu g/m^3$, 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_2 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 40μg/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_2 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 %) [a]	2016 Annual Mean Concentration (µg/m^3) - Bias Adjustment factor = 0.77 [b]
1	Imperial Hotel (WAQF1)	Roadside	N	N	11	22.2
2	Civic Centre (WAQF2)	Urban background	N	N	11	18.1
3	Twynyrodyn 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

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

Site ID	Location	Site Type	Within AQMA?	Triplicate or Co-located Tube	Full Calendar Year Data Capture 2016 (Number of Months or %) [a]	2016 Annual Mean Concentration (µg/m^3) - Bias Adjustment factor = 0.77 [b]
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	**48.5**
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

Site ID	Location	Site Type	Within AQMA?	Triplicate or Co-located Tube	Full Calendar Year Data Capture 2016 (Number of Months or %) [a]	2016 Annual Mean Concentration (µg/m^3) - Bias Adjustment factor = 0.77 [b]
36	15 Lower High Street (36)	Roadside	N	N	10	23.5
38	11 Alexandra Terrace (lamppost) (38)	Roadside	Y	N	12	**40.9**
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_2 annual mean AQS objective of 40µg/m^3

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

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

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

Table 2.6 – Results of NO_2 Diffusion Tubes (2012 to 2016)

Site ID	Site Type	Location	Within AQMA?	Annual Mean Concentration (µg/m^3) - Adjusted for Bias [a]				
				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	Twynyrodyn 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

Site ID	Site Type	Location	Within AQMA?	Annual Mean Concentration (µg/m^3) - Adjusted for Bias [a]				
				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 Twynyrodyn Road (WAQF29)	Roadside	Y	**41.9**	**49.8**	**45.7**	**44.6**	**43.2**
29J	55 Twynyrodyn Road (collocated) (29J)	Roadside	Y		***57.0***	**47.5**	**47.1**	**44.0**

Site ID	Site Type	Location	Within AQMA?	Annual Mean Concentration (µg/m^3) - Adjusted for Bias [a]				
				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 Twynyrodyn 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

Site ID	Site Type	Location	Within AQMA?	Annual Mean Concentration (µg/m^3) - Adjusted for Bias [a]				
				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 Twynyrodyn Road (29H)	Roadside	Y	**41.3**	**51.1**	**45.9**	**45.1**	**48.5**
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

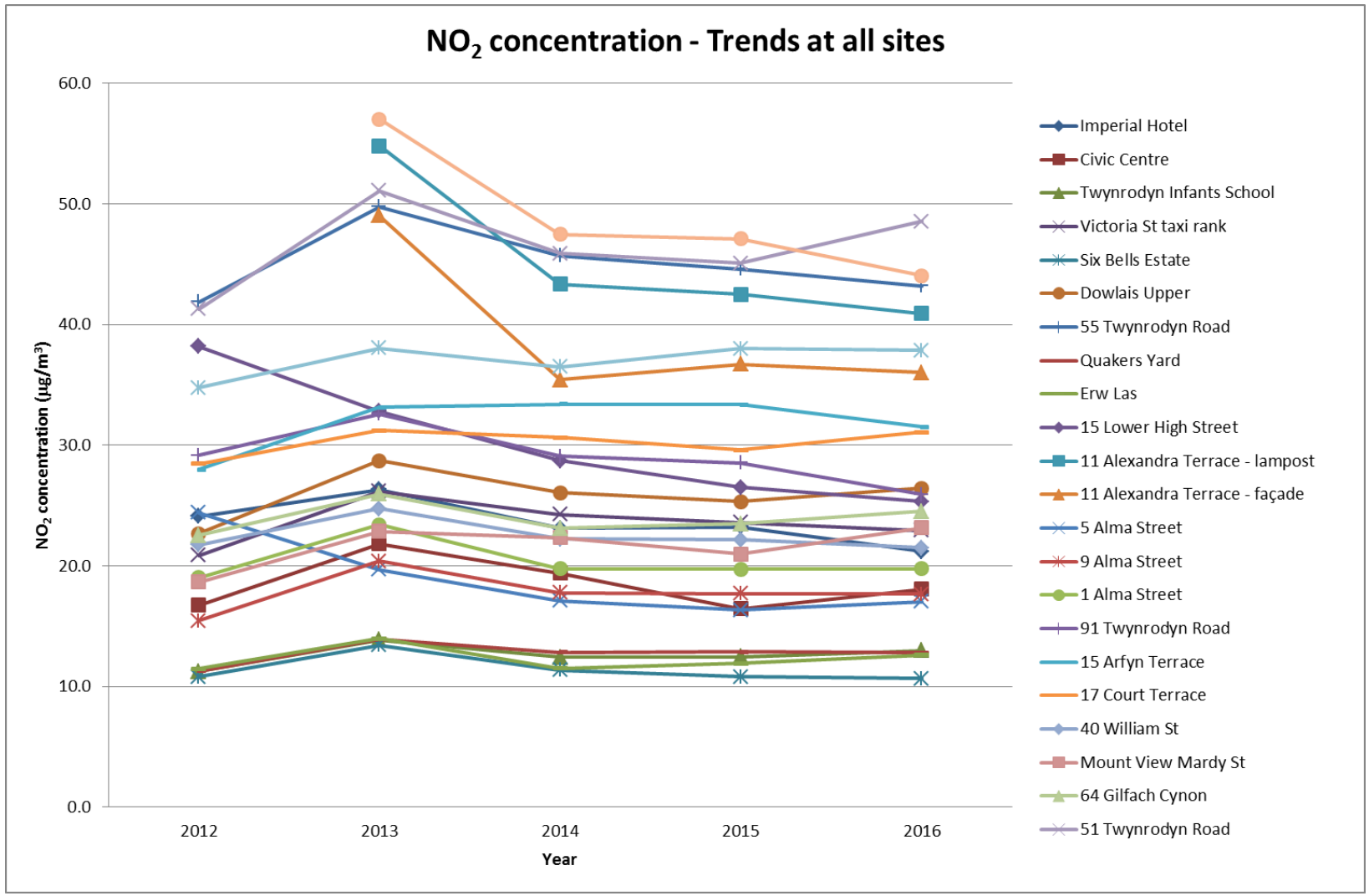
Site ID	Site Type	Location	Within AQMA?	Annual Mean Concentration (µg/m^3) - Adjusted for Bias [a]				
				2012 (Bias Adjustment Factor = 0.69)	2013 (Bias Adjustment Factor = 0.85)	2014 (Bias Adjustment Factor = 0.81)	2015 (Bias Adjustment Factor = 0.79)	2016 (Bias Adjustment Factor = 0.77)
38	11 Alexandra Terrace (lamppost) (38)	Roadside	Y		***54.8***	**43.3**	**42.5**	**40.9**
39	11 Alexandra Terrace (facade) (39)	Kerbside	Y		***49.0***	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

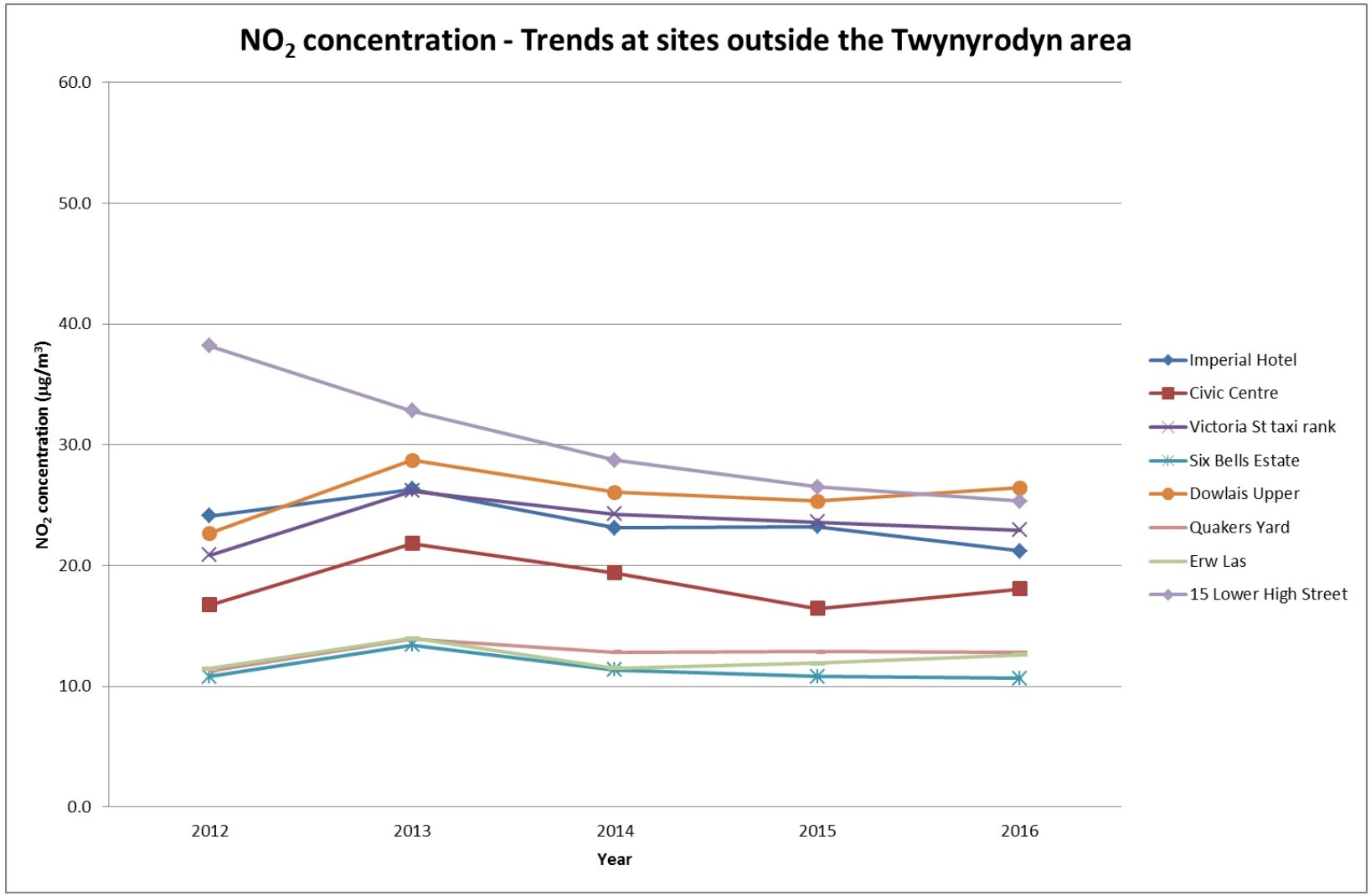
In bold, exceedence of the NO_2 annual mean AQS objective of 40µg/m^3

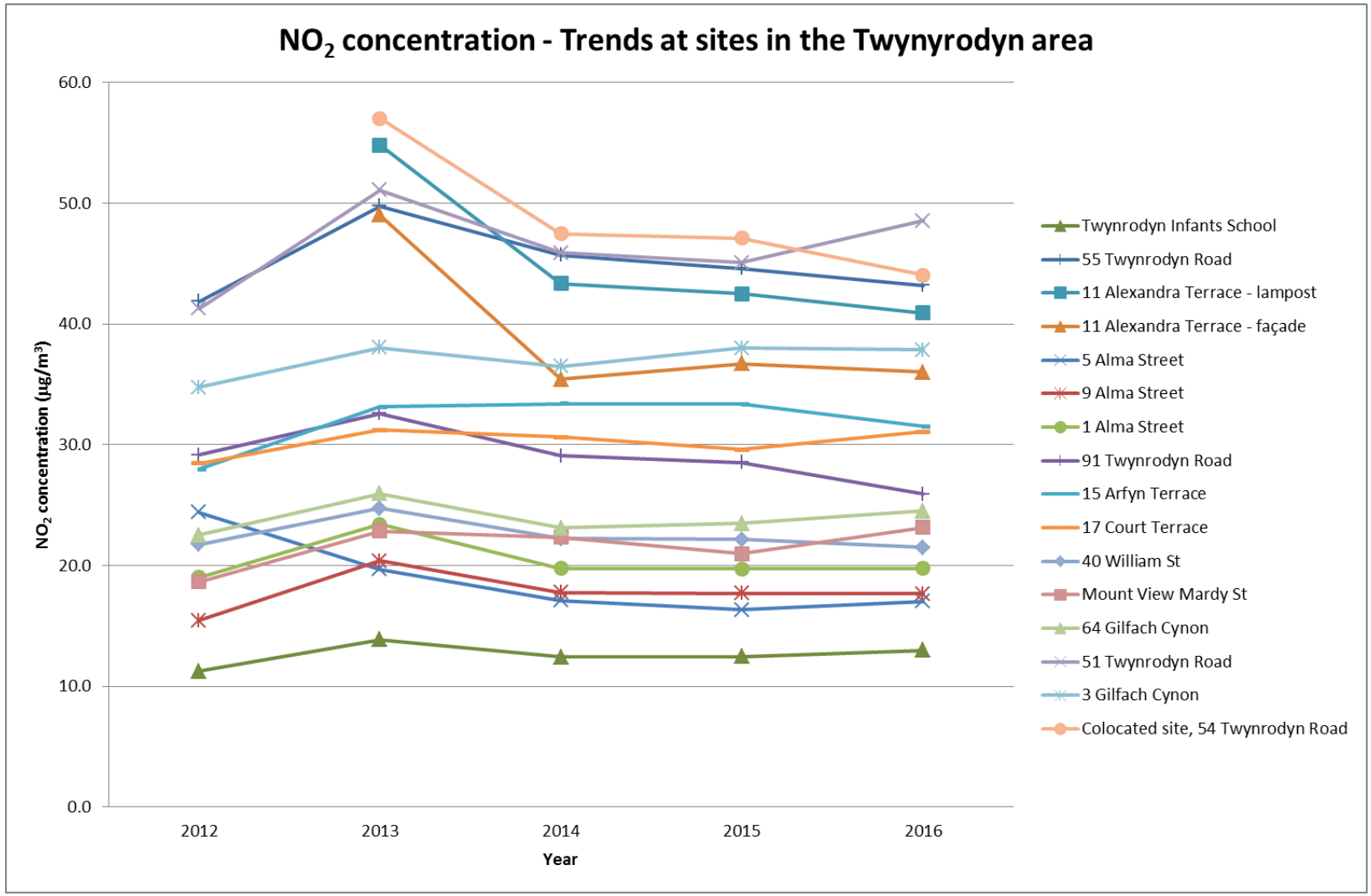
Underlined, annual mean > 60µg/m^3, indicating a potential exceedence of the NO_2 hourly mean AQS objective

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

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




NO2 concentration - Trends at sites outside the Twynyrodyn area
60.0
50.0
40.0
30.0
20.0
10.0
0.0
NO2 concentration (µg/m3)
2012
2013
2014
2015
2016
Year
Imperial Hotel
Civic Centre
Victoria St taxi rank
Six Bells Estate
Dowlais Upper
Quakers Yard
Erw Las
15 Lower High Street


NO2 concentration - Trends at sites in the Twynyrodyn area
NO2 concentration (µg/m3)
60.0
50.0
40.0
30.0
20.0
10.0
0.0
2012
2013
2014
2015
2016
Year
Twynrodyn Infants School
55 Twynrodyn Road
11 Alexandra Terrace - lampost
11 Alexandra Terrace - façade
5 Alma Street
9 Alma Street
1 Alma Street
91 Twynrodyn Road
15 Arfyn Terrace
17 Court Terrace
40 William St
Mount View Mardy St
64 Gilfach Cynon
51 Twynrodyn Road
3 Gilfach Cynon
Colocated site, 54 Twynrodyn Road

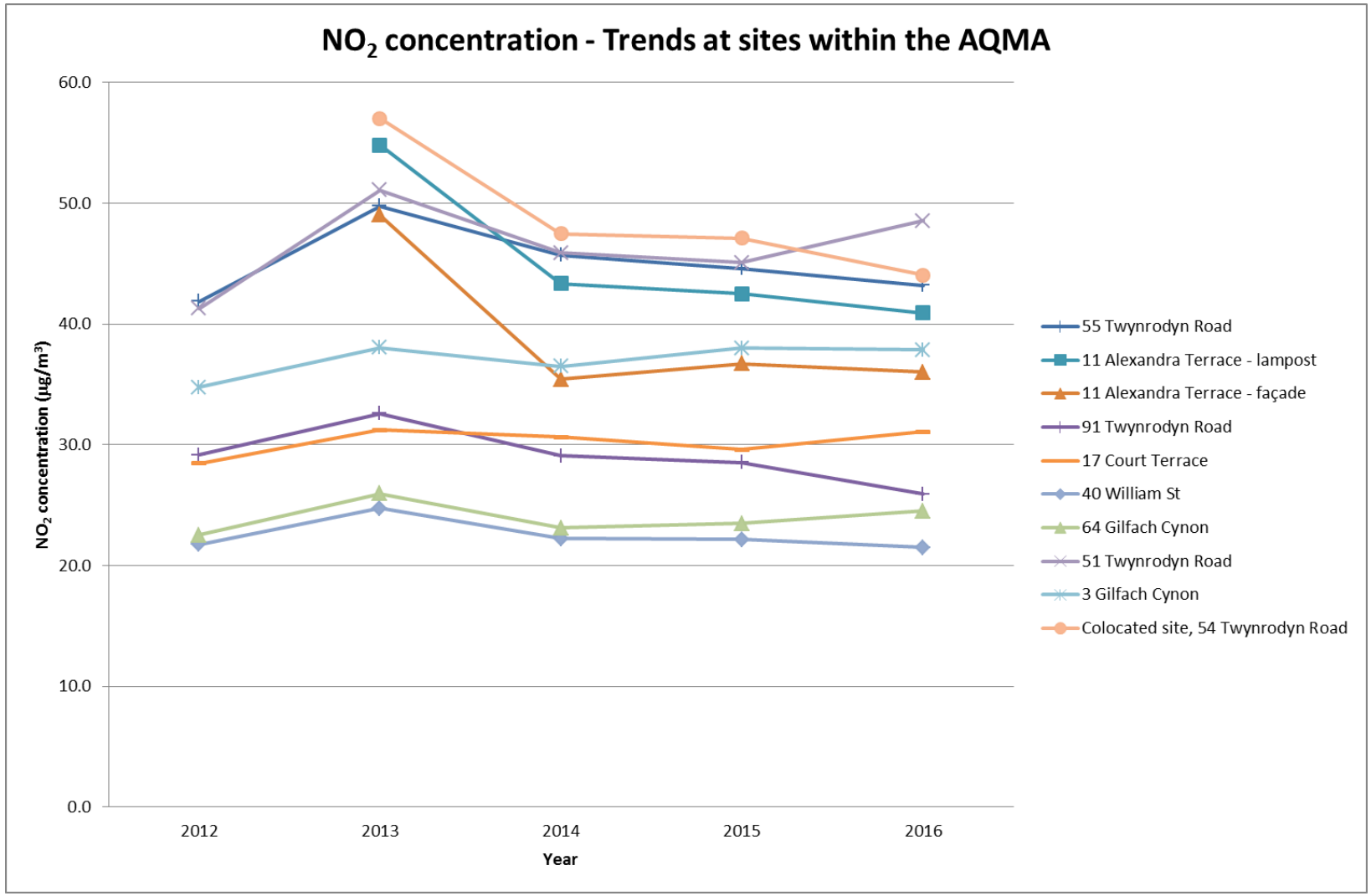

NO2 concentration - Trends at sites within the AQMA
60.0
50.0
40.0
30.0
20.0
10.0
0.0
NO2 concentration (µg/m3)
2012
2013
2014
2015
2016
Year
55 Twynrodyn Road
11 Alexandra Terrace - lampost
11 Alexandra Terrace - façade
91 Twynrodyn Road
17 Court Terrace
40 William St
64 Gilfach Cynon
51 Twynrodyn Road
3 Gilfach Cynon
Colocated site, 54 Twynrodyn Road

Table 2.6 shows an exceedence of the air quality standard for annual NO_2, 40μg/m^3 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_2 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_2 concentrations reduced from 2013 a number of tubes have settled at NO_2 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 on ongoing negative effect on air quality.

Results from 2016 show NO_2 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 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_2 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 30th January 2017 an AQMA was declared. The associated action plan will be produced with the aim of it achieving suitable improvements. As the cause of the exceedence is relatively heavy traffic on an enclosed road with

properties close to the kerbside, the action plan will initially focus on measures to ease traffic flow and to encourage drivers to seek alternative routes.

No annual mean NO_2 concentrations have exceeded 60μg/m^3 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^3.

2.2.2 Particulate Matter (PM_{10})

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_{10} on the Welsh Air Quality Forum.

Table 2.7 – Results of Automatic Monitoring for PM_{10}: Comparison with Annual Mean Objective

Site ID	Site Type	Within AQMA?	Valid Data Capture for Monitoring Period % [a]	Valid Data Capture 2016 % [b]	Confirm Gravimetric Equivalent (Y or N/A)	Annual Mean Concentration (µg/m^3)				
						2012* [c]	2013* [c]	2014* [c]	2015* [c]	2016 [c]
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_{10} annual mean AQS objective of 40µg/m^3

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

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

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

* Annual mean concentrations for previous years are optional

Figure 2.6 – Trends in Annual Mean PM_{10} Concentrations

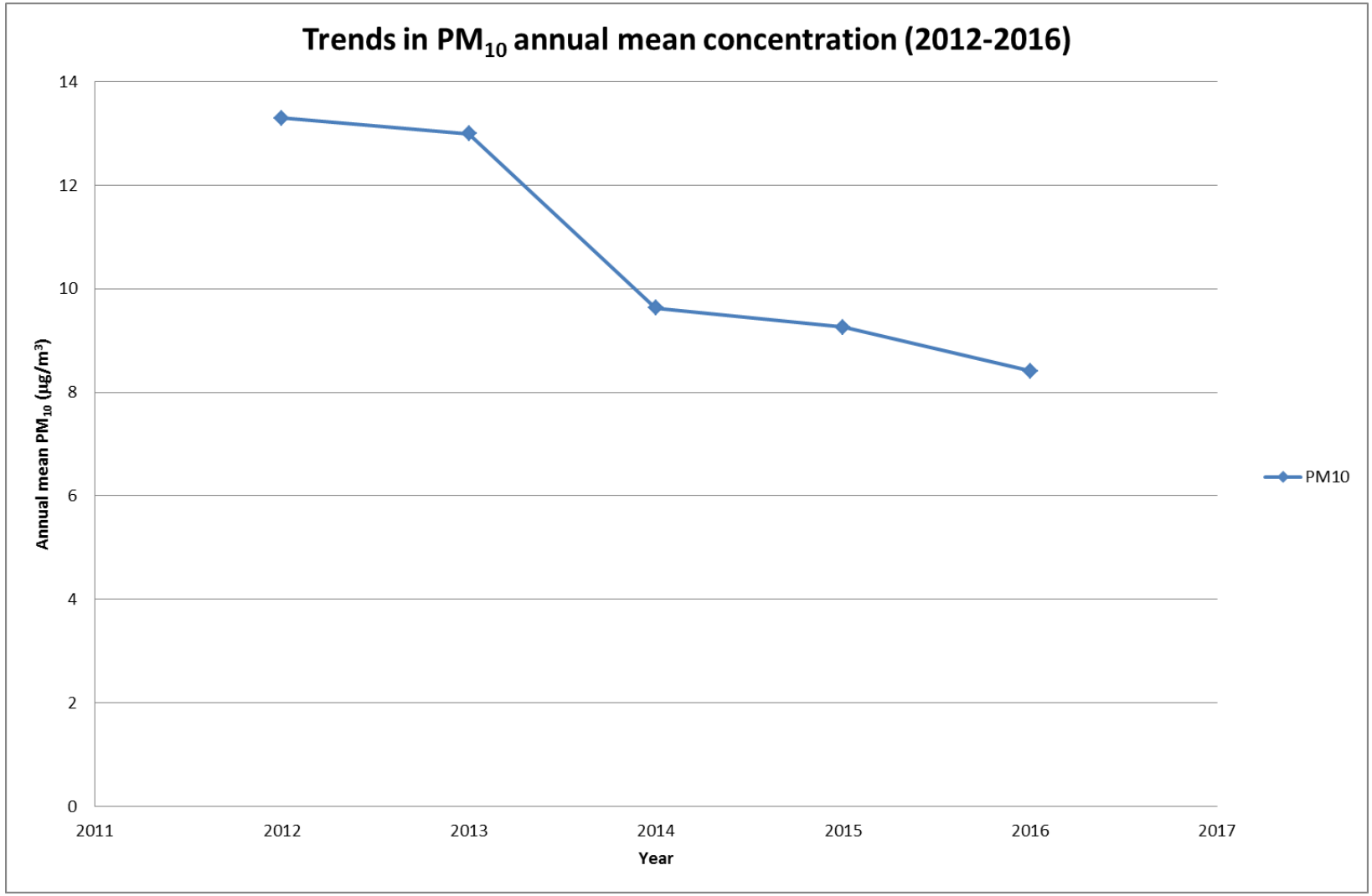


Table 2.8 – Results of Automatic Monitoring for PM_{10}: Comparison with 24-hour Mean Objective

Site ID	Site Type	Within AQMA?	Valid Data Capture for Monitoring Period % [a]	Valid Data Capture 2016 % [b]	Confirm Gravimetric Equivalent (Y or N/A)	Number of Daily Means > 50µg/m^3				
						2012* [c]	2013* [c]	2014* [c]	2015* [c]	2016 [c]
APM1 Twynyrodyn School	Suburban	Y	98.1	98.1	Y	2	0	0	0	0

In bold, exceedence of the PM_{10} daily mean AQS objective (50µg/m^3 – not to be exceeded more than 35 times per year)

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

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

[c] if data capture for full calendar year is less than 85%, include the 90.4th 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

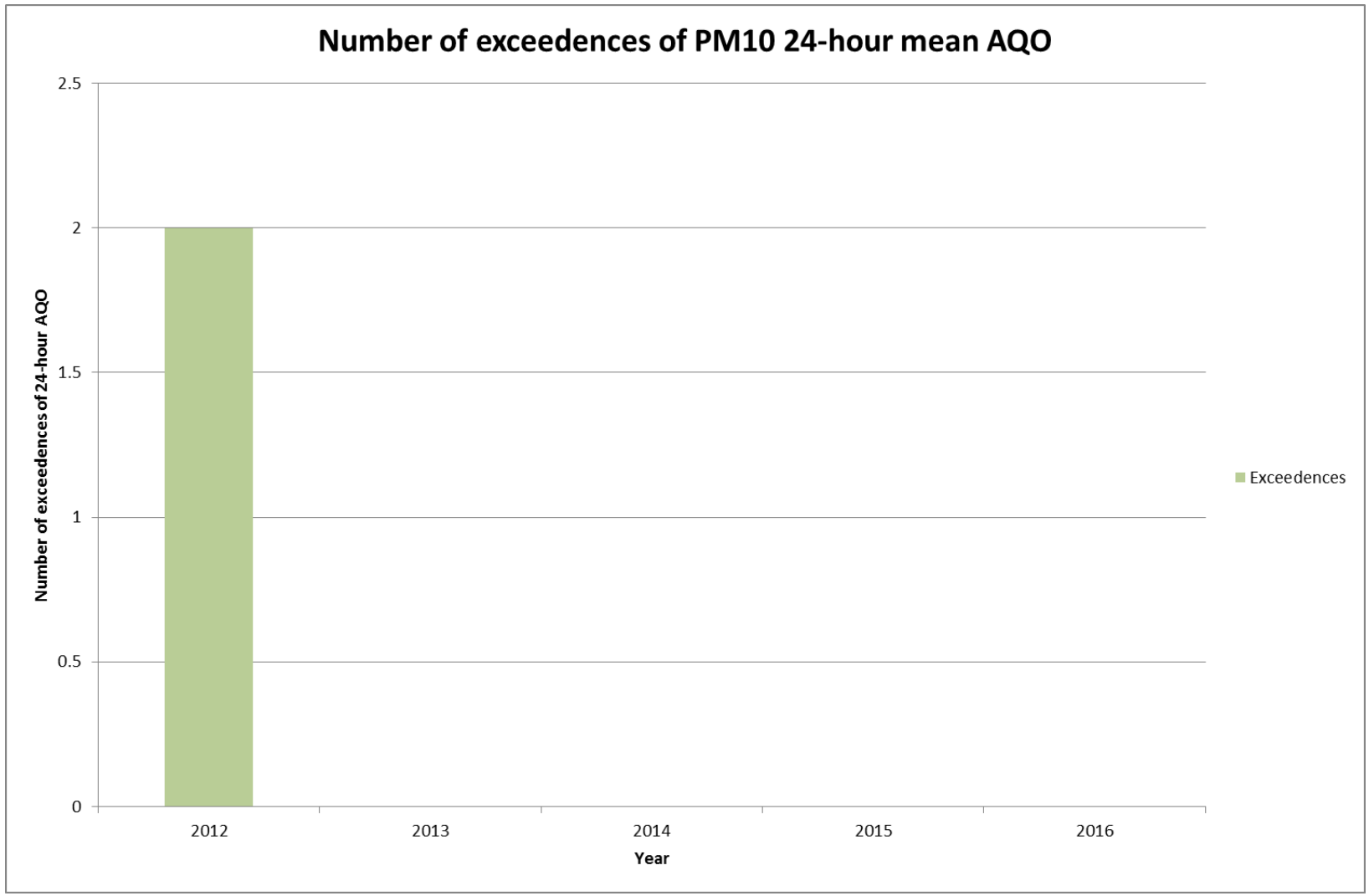


Table 2.7 and Figure 2.5 show PM_{10} has consistently stayed below the air quality standard of 40μg/m^3 annual mean. Table 2.8 and Figure 2.6 show there have been a reducing number of exceedences of 50□g/m^3 24-hour mean. PM_{10} is not considered to pose a problem within Merthyr Tydfil.

2.2.3 Sulphur Dioxide (SO_2)

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^3 for NO_2 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_2. 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 30th 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^2 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_2 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 30th 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_2. 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_2 air quality objective of 40□g/m^3 being breached at 4 diffusion tube locations. This is focussed around 51 Twynyrodyn Road. This is within the AQMA. The NO_2 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^3.

The highest levels of NO2 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_2. 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 30th January 2017. As the exceedence of the NO_2 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

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

Appendices

Appendix 1: QA/QC Data for NO_2 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_2 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_2 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.

National Diffusion Tube Bias Adjustment Factor Spreadsheet — Spreadsheet Version Number: 03/17 V2

Follow the steps below **in the correct order** to show the results of **relevant** co-location studies
Data only apply to tubes exposed monthly and are not suitable for correcting individual short-term monitoring periods
Whenever presenting adjusted data, you should state the adjustment factor used and the version of the spreadsheet
This spreadhseet will be updated every few months: the factors may therefore be subject to change. This should not discourage their immediate use.

This spreadsheet will be updated at the end of June 2017

LAQM Helpdesk Website

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: Select the Laboratory that Analyses Your Tubes from the Drop-Down List

If a laboratory is not shown, we have no data for this laboratory.

Step 2: Select a Preparation Method from the Drop-Down List

If a preparation method is not shown, we have no data for this method at this laboratory.

Step 3: Select a Year from the Drop-Down List

If a year is not shown, we have no data[2]

Step 4:

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[3] shown in blue at the foot of the final column.

If you have your own co-location study then see footnote[4]. If uncertain what to do then contact the Local Air Quality Management Helpdesk at LAQMHelpdesk@uk.bureauveritas.com or 0800 0327953

Analysed By[1]	Method (To undo your selection, choose (All) from the pop-up list)	Year[5] (To undo your selection, choose (All))	Site Type	Local Authority	Length of Study (months)	Diffusion Tube Mean Conc. (Dm) (µg/m³)	Automatic Monitor Mean Conc. (Cm) (µg/m³)	Bias (B)	Tube Precision[6]	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 GallowayCouncil	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	Marylebone 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	Tunbridge 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[3] (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_2 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_2 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_2 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_2 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 ±5ppb. 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_2, rather than as an accurate NO_2 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_{10} and $PM_{2.5}$ 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.

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_{10} and $PM_{2.5}$ 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 (µg/m³)												
		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	Twynyrodyn 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 Twynyrodyn 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 Twynyrodyn 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 Twynyrodyn 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

29F	Mount View Mardy Street (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 (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 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 (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 (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 (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 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 Terrace (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 Terrace (facade) (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 (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 (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 (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_2 and O_3 15-minute readings

The data is available on request.