



# 2018 Annual Air Quality Progress Report for Cardiff Council

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

August 2018



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## Executive Summary: Air Quality in Our Area

### Air Quality in the City of Cardiff Council

Local authorities have a statutory duty under Part IV of the Environment Act 1995 & Air Quality Strategy for England, Scotland, Wales and Northern Ireland 2007 to manage local air quality. The Local Air Quality Management (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 air quality objectives are likely to be achieved.

The air quality objectives applicable to LAQM in Wales are set out in the Air Quality (Wales) Regulations 2000, No. 1940 (Wales 138) and Air Quality (Amendment) (Wales) Regulations 2002, No 3182 (Wales 298). Where the air quality reviews indicate that the air quality objectives may not be met the local authority is required to designate an Air Quality Management Area (AQMA). Action must then be taken at a local level and outlined in a specific Air Quality Action Plan (AQAP) to ensure that air quality in the identified area improves.

In line with the Cardiff Council's (CC) statutory duties under Part IV of the Environment Act 1995, Shared Regulatory Services on behalf of CC undertakes regular air quality monitoring at specifically allocated locations across Cardiff using automated and non-automated principles for ambient air Nitrogen Dioxide (NO<sub>2</sub>), Particulate Matter (PM<sub>10</sub> & PM<sub>2.5</sub>), Sulphur Dioxide (SO<sub>2</sub>), Carbon Monoxide (CO) & Ozone (O<sub>3</sub>).

With regards to prioritising ambient air quality sampling locations, the Council adopts a risk based approach to any allocation of monitoring sites, considering the requirements of The Department for Environment, Food and Rural Affairs' (Defra) Local Air Quality Management Technical Guidance 16, February 2018 (previously April 2016). The designated monitoring locations are assigned based on relevant exposure and where the certain Air Quality Objective levels for a particular pollutant applies. TG(16) states that annual mean objectives should apply at "All locations where members of the public might be regularly exposed. Building facades of residential properties, schools, hospitals, car homes etc."

**Automatic Monitoring Sites-** Cardiff has two automatic air quality monitoring sites located at Frederick Street in the City Centre and on Richard's Terrace, just off Newport Road.

- **Cardiff Frederick Street (Urban Background)**

The site monitors on a 24/7 basis measuring levels of NO<sub>2</sub>, PM<sub>10</sub> & PM<sub>2.5</sub>, SO<sub>2</sub>, CO and O<sub>3</sub> feeding data directly into Defra's Automatic Urban and Rural Network (AURN).

- **Richard's Terrace, Newport Road (Urban Traffic/ Roadside)**

The newly commissioned site (April 2018) monitors on a 24/7 basis measuring levels of NO<sub>2</sub> & PM<sub>10</sub> at that location, feeding data directly into Defra's Automatic Urban and Rural Network (AURN).

**Non-automatic Monitoring Sites-** In 2017 CC operated 75 specifically allocated non automatic monitoring sites in Cardiff which monitor levels of Nitrogen Dioxide (NO<sub>2</sub>).

In 2017, 10 NO<sub>2</sub> diffusion tube locations recorded exceedences of the annual average objective set for NO<sub>2</sub> (40µg/m<sup>3</sup>). Of the 10 exceedences, 6 were documented within the already established air quality management areas (AQMA). The remaining 4 exceedences are discussed further in **Section 2.2** of this report.

In accordance with Welsh Government's (WG) Local Air Quality Management Policy Guidance, July 2017, SRS and CC recognise that there is no defined "safe level" when describing levels of air quality. It is noted that 6 diffusion tube monitoring sites display elevated annual average levels for NO<sub>2</sub>. These sites will need to be closely scrutinised to ensure the annual average objective is not breached in future years. Again this is discussed in further detail in **Section 2.2**.

There were no recorded exceedences of the 1-hour NO<sub>2</sub> objective at any of the monitoring locations in 2017.

At the time of writing this report, for 2018 the NO<sub>2</sub> diffusion tube network has been extensively reviewed and amended to improve and encapsulate a wider foot print of the Cardiff Borough. In total there have been 24 tracked changes to the monitoring network, including additional monitoring within the AQMAs.

Based on monitoring results and further detailed assessments, there are currently four Air Quality Management Areas (AQMA) declared across Cardiff which have all been declared due to exceedences of the annual mean NO<sub>2</sub> Air Quality Standard (40ug/m<sup>3</sup>), known to be derived from road transport.

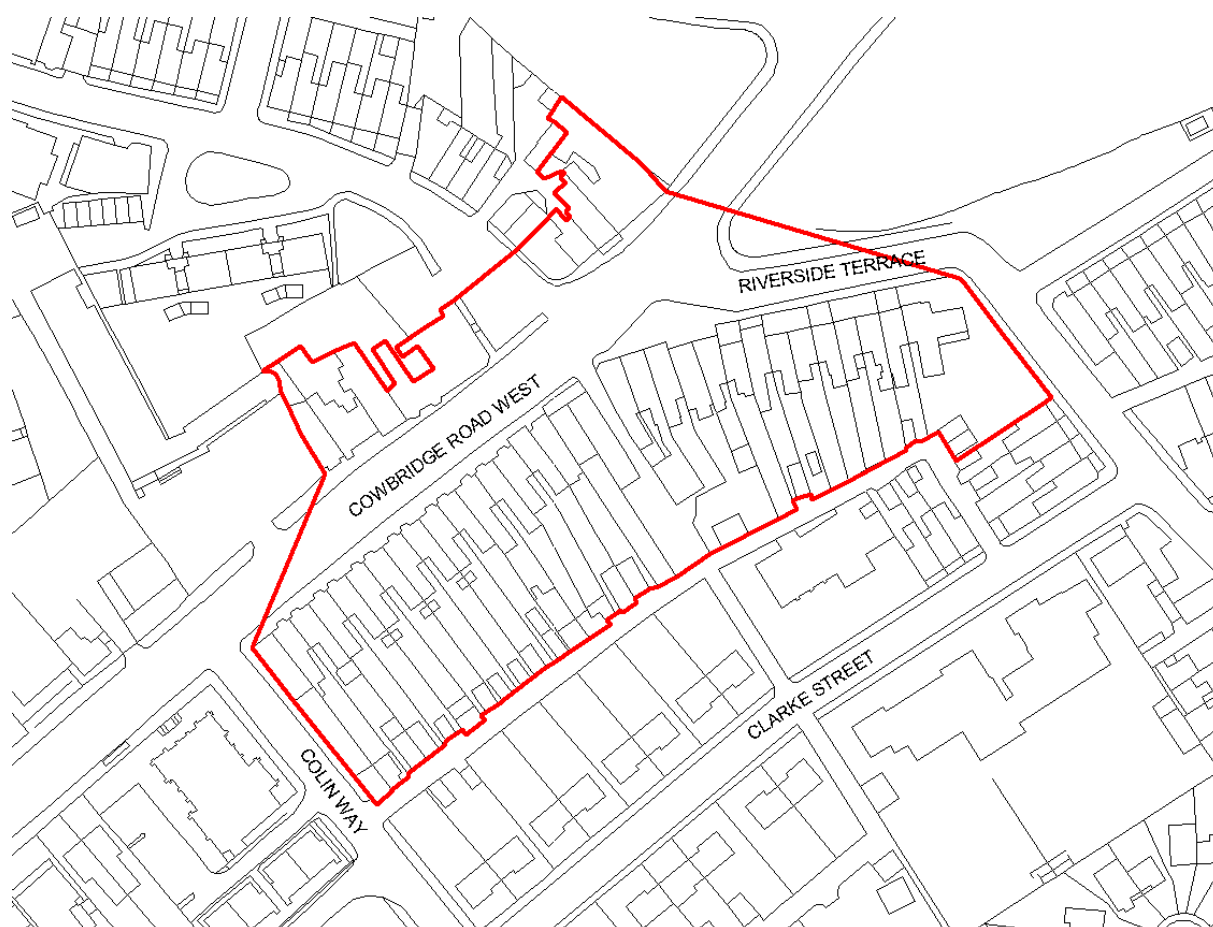
Two AQMAs are primarily focused in Cardiff City Centre: **Cardiff City Centre AQMA**, established 01/04/2013 and **Stephenson Court AQMA**, established 01/12/2010.

North of the City Centre, lies the **Llandaff AQMA** (established 01/04/2013) and to the west of Cardiff is the **Ely Bridge AQMA** (established 01/02/2007).

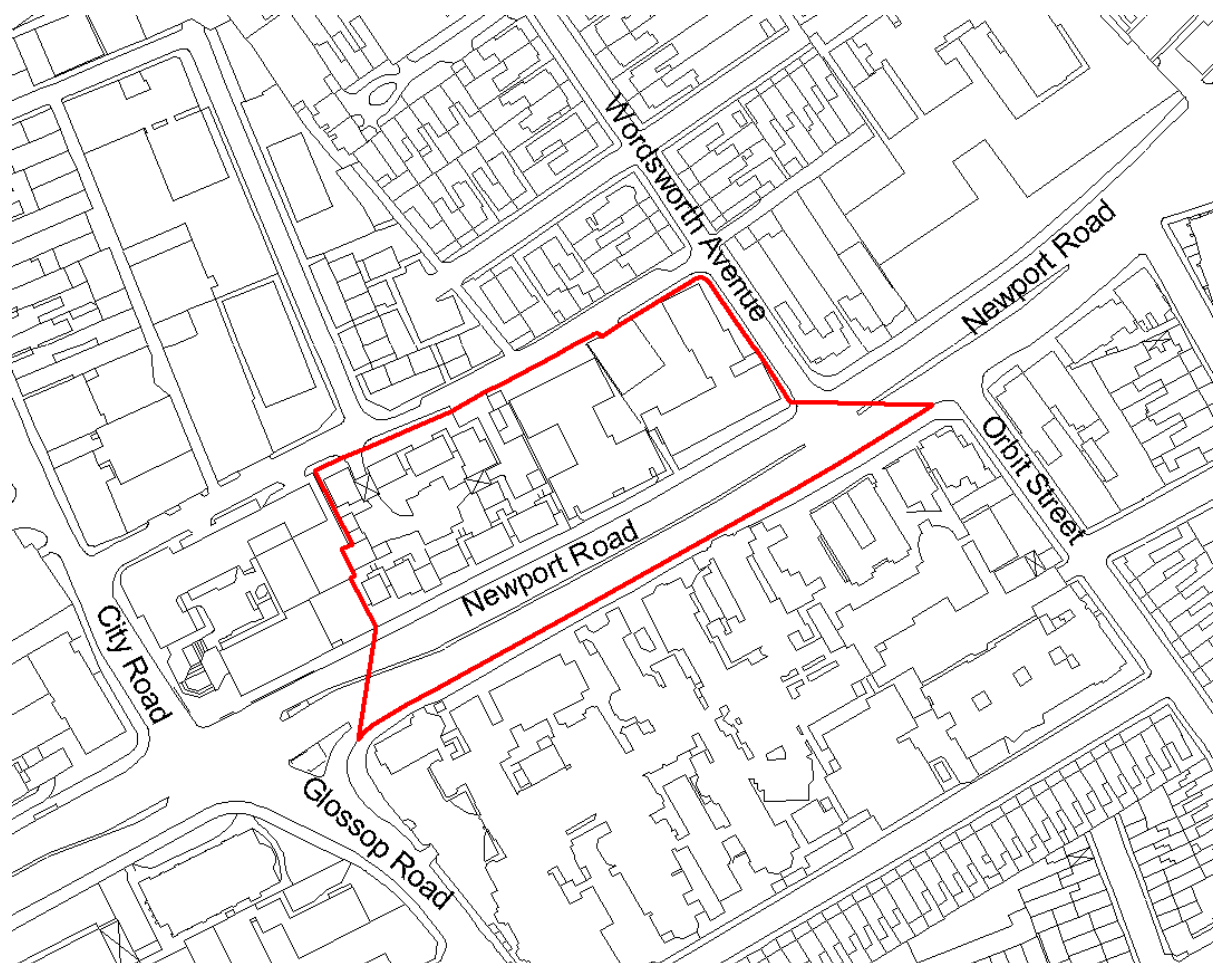
**Figure 1.1 Boundary of Cardiff City Centre AQMA**



**Figure 1.2 Boundary of Ely Bridge AQMA**

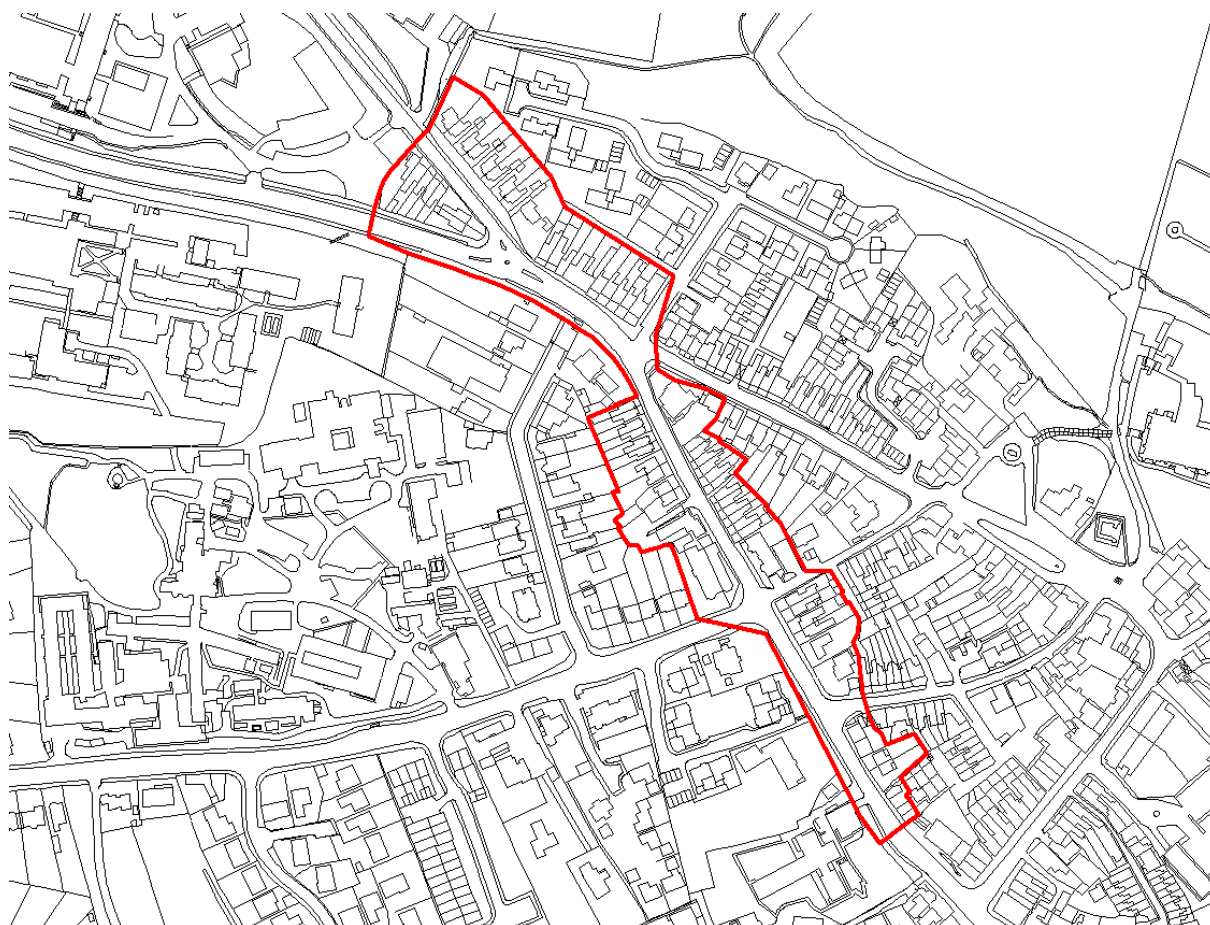


**Figure 1.3 Boundary of Stephenson Court AQMA**





**Figure 1.4 Boundary of Llandaff AQMA**



SRS and CC are very aware of the concerns for air quality impacts. SRS & CC is committed to achieving levels as low as reasonably practicable by demonstrating levels beyond the annual objectives set for pollutants. In order to improve the air quality in Cardiff, action needs to be taken across the city as a whole and it is acknowledged that road traffic emissions (particulate matter (PM) and primary/ secondary nitrogen dioxide (NO<sub>2</sub>)) are the primary contributing factor to poor air quality in Cardiff.

Welsh Government's publication; Local Air Quality Management, Policy Guidance, June 2017 recommended two clear goals:

- (1) achieve compliance with the national air quality objectives in specific hotspots and
- (2) reduce exposure to pollution more widely, so as to achieve the greatest public health benefit.



Collective efforts, therefore, should look beyond targeted action in localised air pollution hotspots and do this in parallel with universal action to reduce risks for everyone.

Highlighting this commitment, SRS & CC has developed a citywide Clean Air Strategy (CAS) & Action Plan for Cardiff. The strategy coincides with Cardiff's Capital Ambition report and helps to implement and deliver the priorities outlined in Ambition report with an overarching aim to improve air quality to protect and improve public health in Cardiff. The CAS & Action Plan appoints strategic measures that will look to generate a positive impact to citywide air quality levels, in particular traffic derived NO<sub>2</sub> levels. Each measure has endured a cost benefit appraisal procedure by weighting the measures in terms of air quality impact, cost and timescale. The key theme of the strategic measures is to increase the uptake of sustainable modes of transport by influencing a behavioural change in Cardiff. The CAS & Action plan accompanies this 2018 APR as a separate document and therefore fulfils the requirements of the LAQM process to produce an Air Quality Action Plan (AQAP).

In addition to Cardiff's 4 AQMAs and CAS & Action Plan work, following the formal publication of Defra's UK detailed air quality plan to tackle roadside nitrogen dioxide (NO<sub>2</sub>) concentrations in July 2017, it was identified from air quality monitoring undertaken by Cardiff Council (CC) and modelled projections from WG that Cardiff would continue to exceed EU & UK Air Quality Directive Limit Values for NO<sub>2</sub> beyond 2020. The report detailed modelled projections from JAQU which showed continued non-compliance of the national annual average NO<sub>2</sub> standard by 2021 along identified road networks. The roads which have been modelled as exceeding the annual limit value are the A4161, the A4232, the A4234, the A470 and the A48. These areas of exceedence are also featured in the CAS & Action Plan document as any mitigation measures implemented on the referenced road links will have an impact on the LAQM AQMAs.

As a result of the detail in the UK Plan, and a subsequent High Court ruling, in March 2018, under Part IV of the Environment Act 1995, Section 85(7), WG issued a formal direction to CC to address its air quality concerns, with particular reference to the specified 5 road links. The direction has been governed by the Welsh Minister for Environment who has determined that the direction deemed necessary to meet obligations placed upon the United Kingdom under the **EU Ambient Air Quality Directive (2008/50/EC)**.

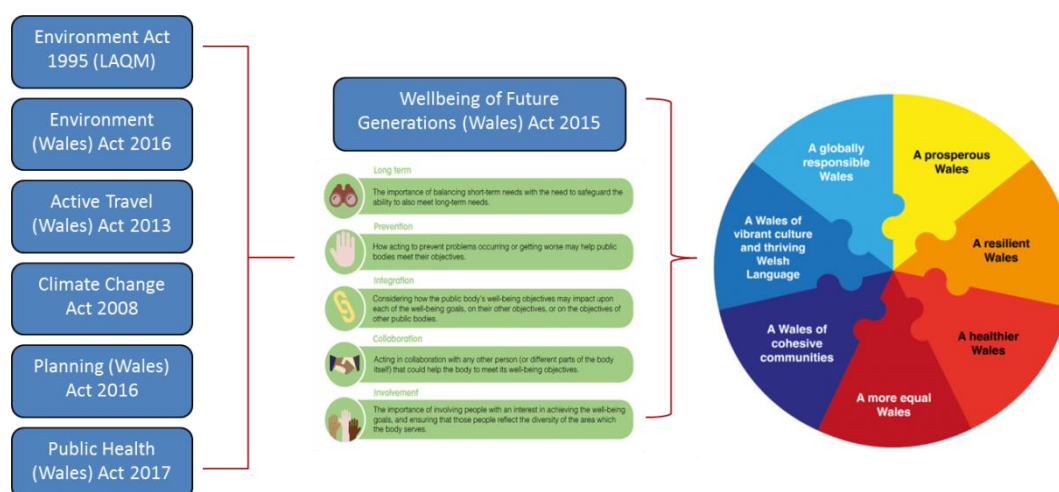
The Direction specifies that CC must undertake a feasibility study in accordance with the HM Treasury's Green Book approach, to identify the option which will deliver compliance with legal limits for nitrogen dioxide in the area for which the authority is responsible, **in the shortest possible time**.

This study will encapsulate the AQMAs and other strategic road networks in Cardiff. Current works are ongoing for the feasibility study and utilising the strategic measures detailed in the CAS & Action Plan a working group assigned to manage the feasibility study has put together package options compiled of committed and desired measures that will be modelled in detail to quantify the impact to NO<sub>2</sub> levels along the referenced road networks depicted by the WG Direction and also the 4 AQMAs.

CC adopts the principles of The Well-being of Future Generations (Wales) Act 2015. The Act is a significant enabler to improve air quality as it calls for sustainable cross-sector action based on the principles of long-term, prevention-focused integration, collaboration and involvement. It intends to improve economic, social, environmental and cultural well-being in Wales to ensure the needs of the present are met without compromising the ability of future generations to meet their own needs. The Act places responsibilities on public bodies in Wales to work in new ways (including via Public Services Boards) towards national Well-being goals. Progress is measured against a suite of well-being and Public Health Outcomes Framework indicators; there is one specifically concerned with air pollution.

As **Figure 1.5** illustrates below, the Act is the legislative vehicle for “Health in all Policies in Wales” and provides the underpinning principles for all policy and decision making, including economic development, in Wales. Reducing air pollution, health risks and inequalities can help contribute to most, if not all, of the well-being goals. As such, the Act presents excellent opportunities to change policy and practice to enhance air quality management arrangements across Cardiff (and wider).

**Figure 1.5- The Well- being of Future Generations (Wales) Act 2015 Matrix**



## Actions to Improve Air Quality

As discussed previously CC currently has 4 established AQMAs within its Borough.

The CAS & Action Plan encapsulates all established AQMAs in Cardiff and sets out the delivery of how Cardiff is set to tackle air quality concerns on a citywide basis. The document considers an array of mitigation measures that should be considered when trying to improve citywide air quality levels. SRS & CC have collaboratively made progress in examining avenues and mechanisms to assist with bringing strategic measures to fruition and therefore enhancing key areas that will in turn improve air quality.

### **Public Transport**

#### Improving Bus Networks

In 2018 SRS along with Cardiff Council's Transport team collaborated with Cardiff Bus company to put forward a bid application submission for the Ultra-Low Emission Bus (ULEB) fund made available by the Department for Transport (DfT).

The proposal draws links between the air quality management areas (AQMAs) identified under the LAQM regime, as well as the issued direction from Welsh Ministers which targets Cardiff on the regional scale highlighting non-conformities in association with European Directives. Therefore linking the two together; Due to the heightened profile of air quality and its potential adverse impact on public health, given Cardiff's Local Air Quality Management scenario, as well as its regional air quality concerns it is imperative that short term measures, such as increasing the uptake of low emission buses are implemented as soon as possible to start the process of achieving compliance with the air quality objectives.

The bid application looks at acquiring a total of 36 electric buses that would be introduced to the Cardiff Bus fleet over a three year cycle. The introduction of the electric buses would form part of a cascade programme whereby Euro 3 standard buses would be offset from the fleet completely, therefore improving the overall fleet composition.

#### Westgate Street Bus Gating Scheme

CC Transport Team have drafted a Stage 1 WelTag Strategic Outline Business Case which looks at Transport Improvements along Westgate Street, located in Cardiff's City Centre Air Quality

Management Area (AQMA). The proposal is yet to be formally submitted to WG however the main objective is to improve sustainable transport infrastructure within the City Centre. The ambition of the project is to conduct a full overhaul of transport facilities and traffic movements on Westgate Street, and to have this in place by the time the new Transport Interchange (Bus Station) in Central Square is operational. Westgate Street is the main bus corridor that will feed the interchange. Bus priority, cycle lanes and public realm improvements will be vital in supporting this new facility.

The proposal acknowledges that air quality is a pressing concern, particularly in the targeted western part of the city, generated by buses and through traffic attributing to congestion. Westgate Street is the main bus route in and out of the Central Square Area and the street currently accommodates over **160 buses per hour**. There are also 14 access points for private car parks and a number loading bays. The street is also used as a through route for general road traffic, as it is one of a few routes that connect the south and the north of the city centre. Due to this heavy use the street is subject to poor air quality.

A key enabler to support air quality improvements is to enable a modal shift by increasing the use of sustainable transport alternatives on Westgate Street. As part of this proposal air quality dispersion modelling has been undertaken which examined a number of infrastructure improvement options and the impact these options had upon air quality levels at sensitive receptor locations in the City Centre. Options modelled.

#### Park & Ride

Developing new bus park and ride facilities at M4 Junction 33 and other appropriate locations in Cardiff and neighbouring areas to reduce the number of cars driving into the city.

#### Development of Central Interchange

In 2018 CC planning department received receipt of a full planning application with contains the proposed design and plans for a new central interchange station.

#### South East Wales Metro

The Cardiff Capital Region Metro proposed by Welsh Government is likely to comprise a combination of rail-based and bus-based rapid transit routes linked through interchanges and using the same network brand and integrated ticketing system. A commitment has been made by Transport for Wales and the detail surrounding these commitments can be found at;



<http://tfw.gov.wales/whats-happening-south-east-wales>

### **Active Travel**

#### School Travel Plans

CC has engaged with 'Living Streets' charity and have developed a 'WOW' (Walk Once a Week) scheme in 7 allocated schools in Cardiff.

#### DRAFT Cycling Strategy (2016- 2026) & Integrated Network Map

The Cardiff Cycling Strategy sets out an ambitious vision to double the number of cycling trips by 2026, from a 9.2% modal share in 2015 to 18.4% in 2026.

The Cycling Strategy and INM proposes two new cycle superhighways which will provide high quality cycle routes, segregated from pedestrians and motor vehicles on busy roads, and will connect strategic development sites, existing residential areas, employment sites, the city centre and Cardiff Bay. These will be supported by a network of secondary routes.

The Integrated Network Map sets out Cardiff Council's 15-year vision to improve cycling and walking routes across the city, in order to meet the requirements of the Active Travel (Wales) Act 2013 to plan for the provision of routes and improvements for active travel.

<https://www.cardiff.gov.uk/ENG/resident/Parking-roads-and-travel/Walking-and-cycling/ActiveTravel/Pages/default.aspx>

#### Nextbike

The Nextbike hire scheme launched in Cardiff in 2018. The scheme is financially funded by Welsh Government and its main objectives are to reduce congestion, free up parking spaces and provide a healthier way to travel around the city. The scheme comprises of 50 docking stations located around Cardiff which facilitate 500 bicycles. To date the scheme has been positively received by members of the public.

#### Car-free Day

On Sunday 13<sup>th</sup> May 2018, CC organised a car-free day event in the city's central area. The event coordinated with the HSBC UK Let's Ride event and on street entertainment.

Footfall in the city centre was up by 28% compared with the same day last year, with 125,173 people recorded in the city centre on Sunday compared with 90,005 people on Sunday May 14<sup>th</sup>, 2017.

Organisers of the event have said that 5,000 people took part in the HSBC UK Let's Ride event, with a further 5,000 people taking part in the entertainment.

As well as providing a carnival atmosphere for the public to enjoy, the idea of Car Free Day was also to monitor air quality and traffic flow in the city centre.

With the increase in footfall in the city centre, the Council was also keen to monitor traffic flows on specific roads that were still open on the periphery of the city centre closure. The results showed a 25% reduction on Newport Road; a 16% reduction on Central Link; a 22% reduction on Cathedral Road; an 11% reduction on Bute Street; an 8% reduction on Clare Road; a 30% reduction on Moira Terrace; an 8% reduction on Fitzalan Place and a 45% reduction on North Road.

City Centre Footfall- City Centre footfall cameras recorded a 28% increase in pedestrian footfall versus the previous year (cameras are located on Queen St, High St, St Mary Street and The Hayes)

Bus Use- Cardiff Bus reported that they had more passengers than they would on a normal 'event day'. Stagecoach recorded a +5% increase in passengers versus a normal Sunday (these figures suggest that most people walked or cycled).

The summary of air quality monitoring;

Shared Regulatory Services (SRS) on behalf of Cardiff Council undertook a study to examine levels of air quality within Cardiff's City Centre in order to quantify the impact that the car-free day event on Sunday 13<sup>th</sup> May 2018 would have on the main traffic derived pollutant of concern nitrogen dioxide (NO<sub>2</sub>). It was anticipated that levels of NO<sub>2</sub> would reduce due to the restriction of vehicles and thus the study was undertaken in order to demonstrate and quantify this likely reduction.

Air Monitors Ltd supplied SRS with three near real-time indicative air quality monitors (AQ Mesh Pods). AQ Mesh pods measure gases, in this case nitric oxide, nitrogen dioxide and ozone using electrochemical sensors powered by Lithium batteries. The data from the pod is pushed to a cloud server where it is corrected for temperature, pressure and relative humidity as well as cross gas interference. To verify the performance of the gas sensors the units ran alongside a reference station



and local scaling factors were derived and used to characterise the sensors. This then enables direct comparison of the data between the pods and the reference station.

In order to give a detailed understanding for the impact to air quality, levels were recorded before and after car-free day to enable a comprehensive comparison between normal baseline conditions and car-free day. The monitors were cited at their specified locations on Friday 4<sup>th</sup> May 2018 and decommissioned on Thursday 24<sup>th</sup> May 2018.

The monitors were located at locations situated on specific network routes influenced by the day's event;

Westgate Street

Castle Street/ Duke Street

Stephenson Court, Newport Road

When comparing Sunday 20<sup>th</sup> May to Car-Free Day event 13<sup>th</sup> May, the daily average reduction for NO<sub>2</sub> is as follows;

Duke Street/ Castle Street- 86.52%

Stephenson Court on Newport Road- 35.80%

Westgate Street- 84.20%

#### 20MPH Zones

CC introduced a 'signs only' 20 miles per hour (mph) limit in the Cathays/Plasnewydd area in March 2014, as part of a two-year pilot project. Following the pilot, a commitment was made to look at how 20pmh limits might be more widely applied in Cardiff. Plans are still ongoing.

#### **Clean Vehicles**

##### Sustainable Fuels Strategy

CC has developed a Sustainable Fuels Strategy to explore the potential to support a move within the city to increased use of sustainable fuels. An independent consultancy specialising in low carbon and fuel cell technologies, were commissioned to undertake a targeted fleet review of Cardiff City Council vehicles.



In the **short term** the following “quick wins” are recommended:

Undertake a managed replacement of Cardiff Council fleet, where cost effective. This would include replacing cars and small vans with EVs, which are expected to save the Council money on a total cost of ownership basis due to lower operating costs;

Install more publicly available EV charging points at appropriate locations throughout the city. The Council should identify as a priority, appropriate locations for charging points and begin to engage potential delivery and funding partners from OLEV and the private sector. The Council should also develop an understanding of business models around the potential direct sale of energy through these on-street charging points.

#### EV feasibility study

In 2018 Arcadis Consulting (UK) Ltd supported by Zero Carbon Futures (UK) Ltd were commissioned by Cardiff Council to prepare a feasibility study to explore how electrically powered Ultra Low Emission Vehicle (ULEV) charging points could be integrated across the city of Cardiff. As the market share of ULEV is growing and is forecasted to increase significantly over the coming decades, it is critical that the necessary charging infrastructure is provided to facilitate this growth, in order to support a cleaner transport system across Cardiff.

#### Green Infrastructure

In January 2018, CC collaborated between different departments and produced a successful application bid to utilise funding made available by Welsh Government, known as Green Infrastructure Grant Funding Scheme. The requested funding is being used to enable a project that focusses on the benefits of trees and planting to the city, with a specific emphasis on methods of addressing air quality issues.

Forming part of the application was the request for revenue to support a “CityTree” structure. One CityTree has a pollution absorbing capacity of 275 urban trees. Although it could be suggested that the CityTree will not resolve air quality concerns in its situated area, it will serve good purpose as a local focal feature raising awareness for the air quality concerns in Cardiff.

The CityTree is expected to be delivered in January 2019 and will be incorporated into the City Centre. With its built in monitoring system and dedicated webpage link the CityTree will be a useful tool for promoting and raising awareness of air quality in Cardiff.

### **Improved monitoring**

#### **No-automatic monitoring**

- For 2018, SRS & CC have begun a monitoring campaign at 9 specific schools across the borough. Cardiff Councillors motioned a review of the current air quality monitoring network established across the borough. It was highlighted that there is a requirement to monitor local air quality in and around school buildings. It was decided that those schools to be monitored will be those highlighted in last year's Client Earth report which discussed potential detrimental air quality impacts at schools in relatively close proximity to major road networks. The report detailed 9 schools within 150m of roads with potentially harmful concentrations of nitrogen dioxide (NO<sub>2</sub>);

- Ysgol Mynydd Bychan, Gabalfa
- St Joseph's RC Primary, Gabalfa
- Stacey Primary, Roath
- Tredegarville CIW Primary, Adamsdown
- Cardiff Academy, Roath
- Mount Stuart Primary, Butetown
- St Peter's RC Primary, Roath
- Cathays High School, Cathays
- St Teilo's CIW High School, Llanedeyrn

As of the w/c 29<sup>th</sup> January Shared Regulatory Services (SRS) on behalf of Cardiff County Council (CCC) commissioned two air quality monitoring locations at each of the schools premises. The monitoring sites monitor levels of nitrogen dioxide (NO<sub>2</sub>) using passive diffusion tubes which are collected and replaced on a rolling monthly basis. The results derived from the diffusion tube sampling are then averaged over the year to enable a comparison of the results against the annual average (40µg/m<sup>3</sup>) and 1-hour (200µg/m<sup>3</sup> not to be exceeded > 18 times per year) air quality objectives set for NO<sub>2</sub>. The results of this monitoring will be included in Cardiff's 2019 Annual Progress Report for air quality.

- In addition to the school monitoring, for 2018, as part of a yearly review SRS have amended and improved the network of diffusion tubes previously assigned in previous years used for the LAQM regime. The amendments include improved monitoring locations to represent the locality of monitoring objectives and implementation of additional sites to AQMAs, such as the Llandaff AQMA.

#### Automatic monitoring

- Towards the end of 2017 discussions were initiated surrounding the implementation of a new automatic NO<sub>x</sub> and PM<sub>10</sub> monitoring station in Cardiff. The newly commissioned site (April 2018) monitors on a 24/7 basis measuring levels of NO<sub>2</sub> & PM<sub>10</sub> at its site on Richards Terrace just off Newport Road, Cardiff. The site's data feeds directly into Defra's Automatic Urban and Rural Network (AURN). The site is governed by Defra and SRS have been appointed the Local Site Operator (LSO).
- Via the already discussed Green Infrastructure (GI) Grant Funding Scheme, the successful funding has also allowed SRS & CC to acquire an indicative real time monitor which will be utilised in an area of strategic planting to illustrate what affects GI has on air quality at a sensitive receptor location.
- Through available S106 financial contributions, SRS & CC has purchased an indicative real time monitor which is scheduled to be utilised on Newport Road in accordance with the Fitzalan Place student accommodation. The monitor is listed as an AQT420 and details of the monitor can be found at <http://www.et.co.uk/products/air-quality-monitoring/air-quality-sensors/air-quality-transmitter-aqt420>

#### Publications & Policies

##### Planning for Health and Well-being SPG (November 2017)

This SPG supplements policies in the adopted Cardiff Local Development Plan (LDP) relating to health and planning and has been developed jointly between the Council and the Cardiff and Vale University Health Board. This interaction underlines the fact that neither health nor planning considerations are made in isolation.

The purpose of this Supplementary Planning Guidance (SPG) is:



- To provide supporting information and guidance for planners, developers and investors on how our environment and the planning decisions we make, impact on the health and wellbeing of the population.
- To help achieve the Council's vision of addressing health inequalities and become a leading city on the world stage as set out in the Capital Ambition Document
- To ensure planning decisions contribute to the national and local Well-being Goals set out in the Well-being of Future Generations (Wales) Act 2015.
- To offer guidance for addressing the effect of the built and natural environment on health and well-being as part of a strategic approach to tackling the city's health inequalities and promoting healthy lifestyle options.
- To provide guidance on appropriate locations for health care facilities.
- To be an important material consideration in the determination of planning applications by setting out a range of potential health and well-being related factors that developers should consider when drawing up development proposals.

Green Infrastructure (GI) Supplementary Planning Guidance (SPG) (November 2017)

This document provides planning advice on a number of areas relating to development and the environment, including protection and provision of open space, ecology and biodiversity, trees, soils, public rights of way, and river corridors.

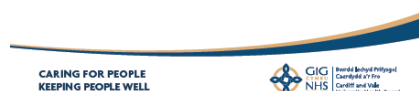
The green infrastructure approach combines all these elements to achieve a more joined-up approach to the environment. This approach is increasing being used in Cardiff and across the UK. In Cardiff, planning advice in this area is often provided by a number of officers from across the Council working together as part of an integrated Green Infrastructure Group. This helps provide a more comprehensive approach.

The new document also differs from previous SPGs by providing more in depth design advice, aimed at giving developers a clearer understanding of the approach expected when submitting designs for new developments. By having this information up-front developers are better able to provide suitable designs to the Council through the planning process.

Moving forwards:  
Healthy travel for all in Cardiff  
and the Vale of Glamorgan



Annual Report of the Director of Public Health  
for Cardiff and Vale of Glamorgan 2017



### Cardiff and Vale University Health Board Report

The report issued in 2017 examines how making active travel alternatives can lead to sustainable improvements in our health and well-being. The report focuses upon Cardiff's air quality concerns and recognises that alternative sustainable transport is a key enabler to improving air quality.

### Transport and Clean Air Green Paper

Led by CC's Cabinet Member for Transport and Strategic Planning the referenced Green Paper sets out proposed ideas to improve transport and air quality in our city. In 2018 the document was released for public consultation to engage with Cardiff residents and collaboratively develop ideas in sight of the responses given. General themes and ideas have been pulled from the document, however analysis of the document is yet to be formally produced.

## Local Priorities and Challenges

The main priorities for SRS and Cardiff Council in the coming year are;

- Finalise and deliver the full- business case for the Clean Air Feasibility study that satisfies the requirements of WG and the previously described Formal Direction.

## How to Get Involved

CC welcomes any correspondence relating to air quality enquiries or concerns. Shared Regulatory Services (SRS) Specialist Services Team represents CC for air quality management and therefore is contactable via the webpage [www.srs.wales/en/Home.aspx](http://www.srs.wales/en/Home.aspx). Hourly and Monthly average monitoring data for pollutants measured is available at <https://airquality.gov.wales/>



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## 1. Actions to Improve Air Quality

### 1.1 Previous Work in Relation to Air Quality

#### Phase 1

The Local Air Quality Management regime commenced with the Air Quality Regulations 1997, which came into force in December of that year. These Regulations were revoked and superceded by the current Air Quality (Wales) Regulations 2000 (as subsequently amended in 2002).

The first phase of the review and assessment process concluded that for six of the seven pollutants included in the regulations there was little or no risk of the objectives being breached and that Air Quality Management Areas (AQMAs) for these pollutants were not necessary. Measures taken at the national level would be sufficient to ensure that there would be no local “hot-spots” of these pollutants and therefore local controls in addition to the national measures would not be required.

However, for the seventh of these pollutants, nitrogen dioxide (NO<sub>2</sub>), it was concluded that national control measures such as vehicle emission and fuel standards, controls on industrial emissions, etc., would not, of themselves, be sufficient to ensure that the air quality objectives for this pollutant would not be met in all areas of Cardiff.

Whilst the vast majority of the area would meet the objectives, there were predicted to be local “hot-spots” close to heavily-trafficked road junctions where there were buildings close to the road and significant amounts of queuing traffic where the objectives would not be met.

As a result, four AQMAs were declared, each having been declared on the basis of measurements and modelling showing predicted breaches of the annual average objective for NO<sub>2</sub>. These AQMAs were known as:

- The Cardiff West AQMA
- The Newport Road AQMA
- The Philog AQMA
- The St Mary Street AQMA

The first three of these came into force on 1<sup>st</sup> December 2000 and the latter on 1<sup>st</sup> September 2002. AQAPs the first three were published in November 2002 and for St Mary Street in February 2010.

## Phase 2

The Council's 2003 USA concluded that for five of the seven pollutants regulated under the LAQM regime there was no evidence to suggest that local "hot-spots" for these pollutants had been missed in the first phase of the review and assessment process and that there was no need to consider these pollutants further at this time.

The 2003 USA also concluded that no local hot-spots of nitrogen dioxide had been overlooked during the first phase of review and assessment and that further detailed assessment of this pollutant was not necessary.

However, whilst the USA concluded that there was no evidence to suggest a likely breach of the 2004 objective for particulate matter (PM<sub>10</sub>), there was considerable doubt that the provisional 2010 objectives for PM<sub>10</sub> would be achieved.

As a result of the conclusions of the 2003 USA the Council issued Progress Reports in 2004 and 2005.

## Phase 3

Following the 2006 USA, the Council published and consulted upon an Air Quality Management Area (AQMA) Review during the autumn of 2006. This concluded that two of the four AQMAs could be revoked and that the then Cardiff West AQMA should be reduced in size and renamed as the Ely Bridge AQMA. Orders making the changes came into force on 1<sup>st</sup> February 2007.

The 2007 Progress Report highlighted a potential problem with regard to nitrogen dioxide concentrations on Newport Road in the immediate vicinity of Stephenson Court, where concentrations had been marginally, but consistently, above the Air Quality objective for a few years. It was concluded that the possibility of declaring a new AQMA would be assessed in the 2008 Progress Report.



The monitoring data for the Stevenson Court area presented in the 2008 Progress Report led to the conclusion that a further “watching brief” would be kept with a view to reaching a firm conclusion once ratified monitoring data for the 2008 calendar year became available.

The monitoring data for 2007 presented in the 2008 Progress Report provided reassurance that the Council’s decisions in respect of the 2006 AQMA Review were soundly based.

#### **Phase 4**

The 2009 USA concluded that a Detailed Assessment for the Stephenson Court area of Newport Road was required as the annual mean concentration of nitrogen dioxide at three sites representative of relevant exposure in the area were above the air quality Objective.

A Detailed Assessment for this area was consulted upon during the summer of 2010 and the AQMA came into force on 1<sup>st</sup> December 2010.

The Council’s 2010 Progress Report was submitted in December 2010 and the 2011 Progress Report in June 2011.

The 2011 Progress Report highlighted abnormally high NO<sub>2</sub> 2010 annual mean concentrations across the Council’s monitoring network which could not be attributed to a particular source and evidence was presented to show that this was a regional issue probably associated with a prolonged period of unusually cold weather during November and December 2010. After dialogue with Welsh Assembly Government with regard to the conclusions reached about this data it was concluded that the Council would proceed to Detailed Assessments for the Llandaff and Westgate Street areas of the city and review the situation with regard to other exceedences when 2011 data is available and reported in 2012.

A Further Assessment for the Stephenson Court AQMA was submitted to WAG for review in December 2011, i.e. one year after the AQMA was declared, in compliance with Section 84(2)(a) of the Environment Act 1995.

#### **Phase 5**

The 2012 USA was the first report in Phase 5 of the review and assessment process.

Monitoring data for 2011 largely confirmed that the annual mean concentrations of nitrogen dioxide previously reported for 2010 were unusually elevated, both locally and regionally, and local concentrations had returned to more typical values in 2011.

Detailed Assessments in respect of nitrogen dioxide in Westgate Street and for the Llandaff area were consulted upon during the summer of 2012 and as a result a new AQMA for Llandaff was declared on 1<sup>st</sup> April 2013 and Westgate Street was incorporated into the St Mary Street AQMA; this latter AQMA is now named Cardiff City Centre AQMA.

The Council's 2013 Progress Report recommended proceeding to a Detailed Assessment for the Fair Oak Road Roundabout in the Plasnewydd Ward of the city as monitoring data over previous years indicated the need. This was submitted for review during 2014. The Assessment concluded that, as monitoring data for 2013 had returned to Objective compliance, there was no need to declare an AQMA at that time. It was proposed to continue monitoring in the area and review the results year-on-year.

The Further Assessment for the City Centre AQMA was submitted in April 2014 and the conclusion that the declaration of the AQMA was justified was accepted.

A Further Assessment for the Llandaff AQMA was also submitted for review in 2014. This concluded that the declaration of the AQMA was justified based upon monitoring data available at the time. However, as monitoring data for 2013 showed compliance with the Objective, it was concluded that there was no need to develop an Action Plan at that time. Monitoring would continue and the situation would be reviewed year-on-year.

In summary, there are currently four AQMAs in Cardiff; all have been declared in respect of NO<sub>2</sub> resulting from road-traffic emissions:

- Cardiff City Centre AQMA
- Ely Bridge AQMA
- Stephenson Court AQMA
- Llandaff AQMA

## Phase 6

The 2015 USA was the first report in Phase 6 of the review and assessment process.

Monitoring data for 2014 largely confirmed that the annual mean concentrations of nitrogen dioxide previously reported for 2010 were unusually elevated, both locally and regionally, and local concentrations had returned to more typical values in 2011.

Monitoring data for 2015 indicated that annual mean concentrations of nitrogen dioxide were not unduly elevated during the year and that in some locations concentrations may have been lower than expected. The 2016 Progress Report showed a number of sites representative of relevant exposure with exceedences of the  $40\mu\text{g}/\text{m}^3$  annual mean objective, however these sites and recorded exceedences were not out of character as were predominantly contained within the declared AQMAs.

## 2017 Annual Progress Report

There are a number of sites representative of relevant exposure with exceedences of the  $\text{NO}_2$  annual mean objective ( $40\mu\text{g}/\text{m}^3$ ). These sites are predominantly contained within the declared AQMAs. However, there are four monitoring locations (Site IDs 172, 180, 181, 185) which are not located within AQMAs.

Site 172 (Ocean Way) is a kerbside location situated up to 650m from any relevant exposure, used to examine potential impacts of traffic resulting from industrial development in the area.

Sites 180 & 181 were implemented due to new developments with the potential for adverse air quality impacting the amenity of future occupants (Windsor House, Windsor Lane & Fitzalan Court, Newport Road). Both developments were under construction in 2016, therefore influencing any datasets recorded. Only recently has the student accommodation at Windsor House been completed and construction still continues at the Fitzalan Court site.

Site 185 is not representative of relevant exposure and does not apply to the annual mean objective set for  $\text{NO}_2$ . Therefore, datasets collected at this monitoring location would apply to the 1-hour objective set for  $\text{NO}_2$  ( **$200\mu\text{g}/\text{m}^3$ , not to be exceeded more than 18 times per year**).

**Monitoring for other pollutants did not result in other exceedences of National Air Quality Standards.**

Due to technical issues, Cardiff City Centre's AURN site recorded low data capture for PM<sub>10</sub> measured by a TEOM- FDMS sampler. The total data capture for the year was 47.1%. As outlined in LAQM (TG16) the data from the sampler has been annualised in accordance with Box 7.9 and the 90.4<sup>th</sup> Percentile value has been given to examine the 24 hour objective.

It was decided not to revoke the Llandaff AQMA. Since the declaration of the Llandaff AQMA in 2013, results have highlighted that levels of NO<sub>2</sub> are generally improving and are now below the national objective of 40µg/m<sup>3</sup> at locations of relevant exposure. Based on recent results the Council could be minded to revoke the AQMA. However the 2017 APR highlighted that any decision made to revoke the AQMA needs to be mindful of the potential development of the strategic LDP sites to the north of the AQMA, Plasdwr and BBC Studios. Whilst detailed air quality assessments undertaken as part of the planning process have modelled that there is unlikely to be a detrimental impact on air quality levels in the AQMA, this can only be fully verified through on going monitoring.

Therefore, in an effort to reassure local residents and to be totally satisfied that levels will remain compliant with the NO<sub>2</sub> standard, SRS on behalf of CC reviewed the non-automatic monitoring network of NO<sub>2</sub> diffusion tubes for 2018. As a result, new and amended monitoring sites have been allocated. Officers will further assess the potential to implement real-time capabilities in the Llandaff AQMA as part of the Council's statutory duties under Part IV of the Environment Act 1995. There are now four monitoring locations within the Llandaff AQMA.

**Monitoring for other pollutants did not result in other exceedences of National Air Quality Standards.**

## 1.2 Air Quality Management Areas

Air Quality Management Areas (AQMA's) are declared when air quality is close to or above an acceptable level of pollution (known as the air quality objective (Please see Appendix A)). After declaring an AQMA the authority must prepare a **DRAFT** Air Quality Action Plan (AQAP) within 18 months setting out measures it intends to put in place to improve air quality to at least the air quality objectives, if not even better. The AQAP must be **formally** adopted prior to 24 months has elapsed. AQMA(s) are seen by local authorities as the focal points to channel resources into the most pressing areas of pollution as a priority.

Based on monitoring results and further detailed assessments, there are currently four Air Quality Management Areas (AQMA's) declared across Cardiff which have all been declared due to

exceedances of the annual mean NO<sub>2</sub> Air Quality Standard (40ug/m<sup>3</sup>), known to be derived from road transport derived NO<sub>2</sub>.

1. **Cardiff City Centre**- declared 1<sup>st</sup> April 2013
2. **Llandaff**- declared 1<sup>st</sup> April 2013
3. **Stephenson Court**- declared 1s December 2010
4. **Ely Bridge**- declared 1<sup>st</sup> Feb 2007

## 1.3 Implementation of Action Plans

Each of these AQMA's was declared as a result of road-traffic derived Nitrogen Dioxide (NO<sub>2</sub>).

SRS on behalf of Cardiff Council has a statutory requirement to produce an Air Quality Action Plan (AQAP) for each identified AQMA within the local authority area. However previous experience in implementing singular actions plans in Cardiff has not proven to be sufficiently successful. The main issue with this particular approach is that the AQAP focuses on introducing local measures to individual road links/ areas, which only targets at improving air quality within the identified AQMA itself.

Whilst such measures have been successful in improving air quality within the individual AQMA (High Street/ St Mary's Street Action Plan) such localised measures can, and have led, to adverse impacts on air quality in surrounding areas and result in more widespread air quality issues. These plans have not looked sufficiently at the primary cause of the problem, this being road traffic derived emissions, resulting in air quality levels being detrimentally increased in neighbouring areas.

As previously discussed, in sight of this way of thinking, in the form of the CAS & Action Plan SRS & CC has considered a holistic approach to address air quality on a citywide basis. Details off all measures completed, in progress or planned are set out in **Table 1.1**. More detail on these measures can be found in the CAS & Action Plan document

**Table 1.1 – Progress on Measures to Improve Air Quality**

No.	Measure	Category	Focus	Lead Authority	Planning Phase	Implementation Phase	Indicator	Target Annual Emission Reduction in the AQMA	Progress to Date	Progress in Last 12 Months	Estimated Completion Date	Comments Relating to Emission Reductions
<b>Modal Shift &amp; Influencing Travel Choice</b>												
1.1	Increase Bus Use	Alternatives to private vehicle use	Proposals are in place for a park and ride system at Junction 33 which would look to intercept traffic on the A470, north Cardiff.	CC	No definite Start Date		Bus patronage figures produced via telematics	Unknown	Ongoing		Ongoing	
1.2	Promotion of cycling and walking	Promoting Travel Alternatives	DRAFT Cycling Strategy sets out to double number of cycling trips by 2026; 9.2% modal share in 2015 to 18.4% in 2026. Two new cycle superhighways proposed. The INM prioritises	CC	Ongoing			Unknown	Public Consultation undertaken		Ongoing	

No.	Measure	Category	Focus	Lead Authority	Planning Phase	Implementation Phase	Indicator	Target Annual Emission Reduction in the AQMA	Progress to Date	Progress in Last 12 Months	Estimated Completion Date	Comments Relating to Emission Reductions
			cycling and walking routes over 15 year period.									
1.3	School Travel Plans		CC has engaged with 'Living Streets' charity and have developed a 'WOW' (Walk Once a Week) scheme in 7 allocated schools in Cardiff.	CC & Living Streets Charity	Ongoing		Report updates from Living Streets	Unknown	7 allocated schools in Cardiff supported by CC.	-	Ongoing	
1.4	Increase awareness of air quality concerns	Public Information	Cardiff 'car-free' day	CC	Completed 2018		Air Quality Measurements, Footfall measurements, Bus patronage numbers recorded	No target	Car- free day in Cardiff was a great success;  When comparing Sunday 20 <sup>th</sup> May to Car-Free Day event 13 <sup>th</sup> May, the daily average reduction for NO <sub>2</sub> is as follows;  Duke Street/ Castle Street- 86.52%  Stephenson Court on Newport Road- 35.80%			Try to expand and hold car-free days more regularly in Cardiff.



No.	Measure	Category	Focus	Lead Authority	Planning Phase	Implementation Phase	Indicator	Target Annual Emission Reduction in the AQMA	Progress to Date	Progress in Last 12 Months	Estimated Completion Date	Comments Relating to Emission Reductions
									Westgate Street- 84.20%			
1.5			Green Infrastructure bid application	CC & WG	Complete	January 2019	Air quality levels recorded at the structure	No target	CC was successful in January 2018 with its bid application for a City-Tree structure, which is due to be implemented in Cardiff City Centre January 2019.			
<b>Infrastructure</b>												
2.1	Bus Route Improvement	Transport Planning and Infrastructure	Westgate Street Scheme- Bus gating options	CC & WG	2018		Weltag stage 1 and 2 Assessments	To ensure development does not cause any adverse impact and where possible reduce levels to as low as reasonably practicable		Submission of Weltag stage 1 outline business case	Ongoing	
2.2	Bus Route Improvement		Improve bus networks and efficiency of the service.	CC	Ongoing		Improvements to air quality levels monitored by indicative methods by CC at sensitive	Unknown	Bus lanes have been installed on A470, A4119 & A48. Suggested			

No.	Measure	Category	Focus	Lead Authority	Planning Phase	Implementation Phase	Indicator	Target Annual Emission Reduction in the AQMA	Progress to Date	Progress in Last 12 Months	Estimated Completion Date	Comments Relating to Emission Reductions
							receptor locations on specified routes		400m of bus lane ensures each bus with a time advantage of 5 minutes.			
2.3	Public Cycle hire Scheme		Next Bike Hire Scheme	CC & WG	Ongoing		Daily reports on usage provided to CC	Unknown	50 docking stations installed providing 500 bicycles for public use		Ongoing	
2.4	Cycle Network		5 proposed Cycle Superhighways	CC	Ongoing				Public consultation on proposals for St Andrew's Crescent to Senghennydd Road- now closed		Ongoing	
2.4	Public transport improvements- interchanges stations and services		New Cardiff Central Interchange development	CC	Ongoing		Detailed AQAs quantifying the level of impact to air quality levels.	To ensure development does not cause any adverse impact and where possible reduce levels to as low as reasonably practicable	Planning application received in 2018 for the central interchange proposal including new bus station		Ongoing	

No.	Measure	Category	Focus	Lead Authority	Planning Phase	Implementation Phase	Indicator	Target Annual Emission Reduction in the AQMA	Progress to Date	Progress in Last 12 Months	Estimated Completion Date	Comments Relating to Emission Reductions
2.5			Cardiff Capital Region Metro - Proposed by WG (Rail and bus based rapid transit routes).	CC & WG	Ongoing			Unknown-supporting AQA will be a likely during the design and application stages	Ongoing		Ongoing	
2.6	20 mph zones	Traffic Management	Implement further speed restrictions and enhance those already established "20mph Zones"	CC	Ongoing			Unknown	CC has introduced 'signs only' 20mph limits in Cathays and Plasnewydd area. Approach coincides with the Safe Routes to School Programme.		Ongoing	
<b>Lower Emission Vehicles</b>												
3.1	Public Vehicle Procurement	Promoting Low Emission Transport	Ultra-Low Emission Bus (ULEB) fund made available by the Department for Transport (DfT).	CC, DfT & Cardiff Bus	Ongoing	Three year rolling programme 2019- 2021	Improvements to air quality levels (NO2) monitored by indicative methods by CC at sensitive receptor locations on specified routes	Approximately >2µg/m3 reductions in NO2 sensitive receptor locations along Westgate Street	Application received by DfT		End September 2018- final verdict on success of application	

No.	Measure	Category	Focus	Lead Authority	Planning Phase	Implementation Phase	Indicator	Target Annual Emission Reduction in the AQMA	Progress to Date	Progress in Last 12 Months	Estimated Completion Date	Comments Relating to Emission Reductions
3.2	Company Vehicle Procurement- Prioritising uptake of low emission vehicles		Sustainable fuels strategy- assessment of Cardiff Council vehicle fleets	CC	Ongoing		Economic savings and reduced Carbon footprint	Unknown	Documentation produced.		Ongoing	
<b>Policy</b>												
4.1	Citywide strategy to reduce emissions and improve air quality	Policy Guidance and Development Control	Cardiff Clean Air Strategy and Action Plan	CC	2018		Recorded Improvements to air quality levels (NO2) monitored by indicative methods by CC at sensitive receptor locations	Annual average NO2 levels to be recorded at <35µg/m3 at residential façade locations with specified AQMAs.	DRAFT Completed and due for review		2018	

## 2. Air Quality Monitoring Data and Comparison with Air Quality Objectives

### 2.1 Summary of Monitoring Undertaken in 2017

#### 2.1.1 Automatic Monitoring Sites

During 2017 monitoring took place at one automatic monitoring site in Cardiff, i.e. DEFRA's Cardiff Centre AURN site in Frederick Street (adjacent to the pedestrianized Queen Street shopping centre).

The Cardiff Centre AURN has been operating since May 1992. The station is part of DEFRA's AURN network and there are similar stations located in towns and cities across the UK.

This site is subject to six-monthly QA/QC audits by AEA, DEFRA's appointed contractor, and calibration gases are all traceable to National Standards. Calibrations have been carried out fortnightly by the appointed contractor. The repair and replacement of equipment has been contracted to suppliers of national repute throughout the station's working life. In February 2007 the PM<sub>10</sub> analyser was replaced with a PM<sub>10</sub> FDMS analyser and the site was augmented with a PM<sub>2.5</sub> FDMS analyser in August 2008.

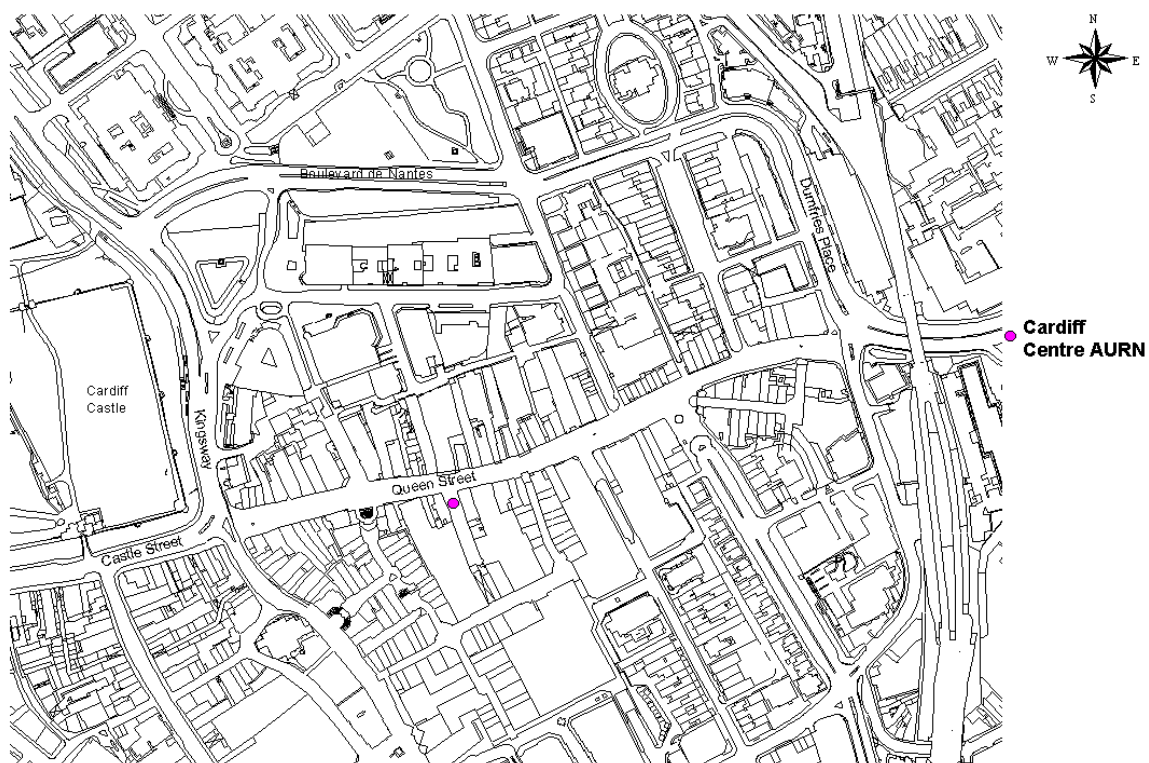
Data from the Cardiff Centre AURN site has been validated and ratified by Ricardo-AEA and was downloaded from the Welsh Air Quality Forum database. The site can be accessed here:

*<http://www.welshairquality.co.uk/>*

For 2017, data capture for NO<sub>2</sub> was recorded at 99% and 91% for PM<sub>10</sub>.

There are three diffusion tubes co-located at the station, whereby at the end of year, depending on data capture and precision, a locally derived bias adjustment factor is calculated. The bias adjustment factor derived from the co-location study was 0.74. This adjustment has not been applied to the network of diffusion tubes due to the fact that the National Bias Adjustment Factor supplied by the LAQM DEFRA website, based on 29 studies, which appointed ESG Didcot laboratory, was slightly higher at 0.77. In order to provide a conservative approach it was therefore decided to adopt the nationally derived bias adjustment factor as this would give slightly higher concentrations and fundamentally represent a worst case scenario.

**Figure 2.1 Location of Cardiff Centre AURN Monitoring Site**



**Table 2.1 Details of Automatic Monitoring Sites**

Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Monitoring Technique	Relevant Exposure? (Y/N with distance (m) to relevant exposure)	Distance to kerb of nearest road (N/A if not applicable)	Does this location represent worst-case exposure?
<b>Cardiff Centre AURN</b>	Urban Background	318416	176525	NO <sub>2</sub>	N	Chemiluminescence	Y (5m)	200m	N
<b>Cardiff Centre AURN</b>	Urban Background	318416	176525	PM <sub>10</sub> , PM <sub>2.5</sub>	N	TEOM- FDMS	Y (5m)	200m	N
<b>Cardiff Centre AURN</b>	Urban Background	318416	176525	SO <sub>2</sub>	N	UV Fluorescence	Y (5m)	200m	N
<b>Cardiff Centre AURN</b>	Urban Background	318416	176525	CO	N	Infra-Red GFC	Y (5m)	200m	N
<b>Cardiff Centre AURN</b>	Urban Background	318416	176525	O <sub>3</sub>	N	UV Absorption	Y (5m)	200m	N



### 2.1.2 Non-Automatic Monitoring Sites

SRS on behalf of CC carries out monitoring of ambient air quality for nitrogen dioxide (NO<sub>2</sub>). In 2017, **75** specifically allocated non-automatic monitoring sites in Cardiff monitored levels of nitrogen dioxide (NO<sub>2</sub>). The non-automatic sites do not provide live data; instead they consist of diffusion tubes which are placed at each of the sites, collected and replaced on a rolling monthly basis. The results derived from the tube sampling are then averaged over the year to enable a comparison of the results against the **annual average (40µg/m<sup>3</sup>) and 1-hour (200µg/m<sup>3</sup> not to be exceeded > 18 times per year)** air quality objectives for NO<sub>2</sub>.

With regards to prioritising ambient air quality sampling locations, the Council adopts a risk based approach to any allocation of monitoring sites, considering the requirements of Local Air Quality Management Technical Guidance 16, February 2018 (previously April 2016). The designated monitoring locations have been assigned based on relevant exposure and where the certain Air Quality Objective levels for a particular pollutant applies. The document states that annual mean objectives should apply at “All locations where members of the public might be regularly exposed. Building facades of residential properties, schools, hospitals, car homes etc.”

National background concentrations provided by Defra are now utilised for the purpose of bias correcting and annualising data can be obtained via the website link:

<https://uk-air.defra.gov.uk/data/laqm-background-maps?year=2015>

The location, site description and data gathered since January 2017 are given in **Table 2.2**. The data has been gathered over a period of 12 months between January and December 2017, adhering to specific monitoring dates controlled by Defra.

### Laboratory Methods and Analysis of Diffusion Tubes

Analysis of the exposed tubes is carried out by Environmental Scientifics Group Didcot (**now formally known as Socotec**) operating procedure HS/GW1/1015, issue 10. The tubes are prepared by spiking acetone:triethanolamine (50:50) on the grids prior to the tubes being assembled. The tubes are desorbed with distilled water and the extract analysed using a segmented flow auto analyser with ultraviolet detection. As set out in the practical guidance the results were initially calculated assuming an ambient temperature of 11°C and then adjusted to 20°C to allow direct comparison with



EU limits. The national bias correction factor for this laboratory was utilised as opposed to our own local co-location data. The reason for this was due to an inconsistent calibration record, whereby calibrations of the NO<sub>x</sub> analyser were not undertaken every two weeks, as outlined in LAQM (TG16). Adopting best practice, no local co-location was carried out and a bias correction factor of 0.77 was obtained and applied using the DEFRA website, available using the following link; <https://laqm.defra.gov.uk/bias-adjustment-factors/national-bias.html>

Where valid data capture for the year is less than 75% (9 months), the NO<sub>2</sub> diffusion tube monitoring data have been “annualised” following the methods as described in Box 7.10 of LAQM (TG16).

Where an exceedance is measured at a monitoring site not representative of public exposure, NO<sub>2</sub> concentration at the nearest relevant exposure has been estimated based on the “NO<sub>2</sub> fall-off with distance” calculator (<http://laqm.defra.gov.uk/tools-monitoring-data/no2-falloff.html>). The procedure is described in LAQM. TG16 Section 7.77-7.79.



Figure 2.2 Map Showing Location and Distribution of Diffusion Tubes in 2017

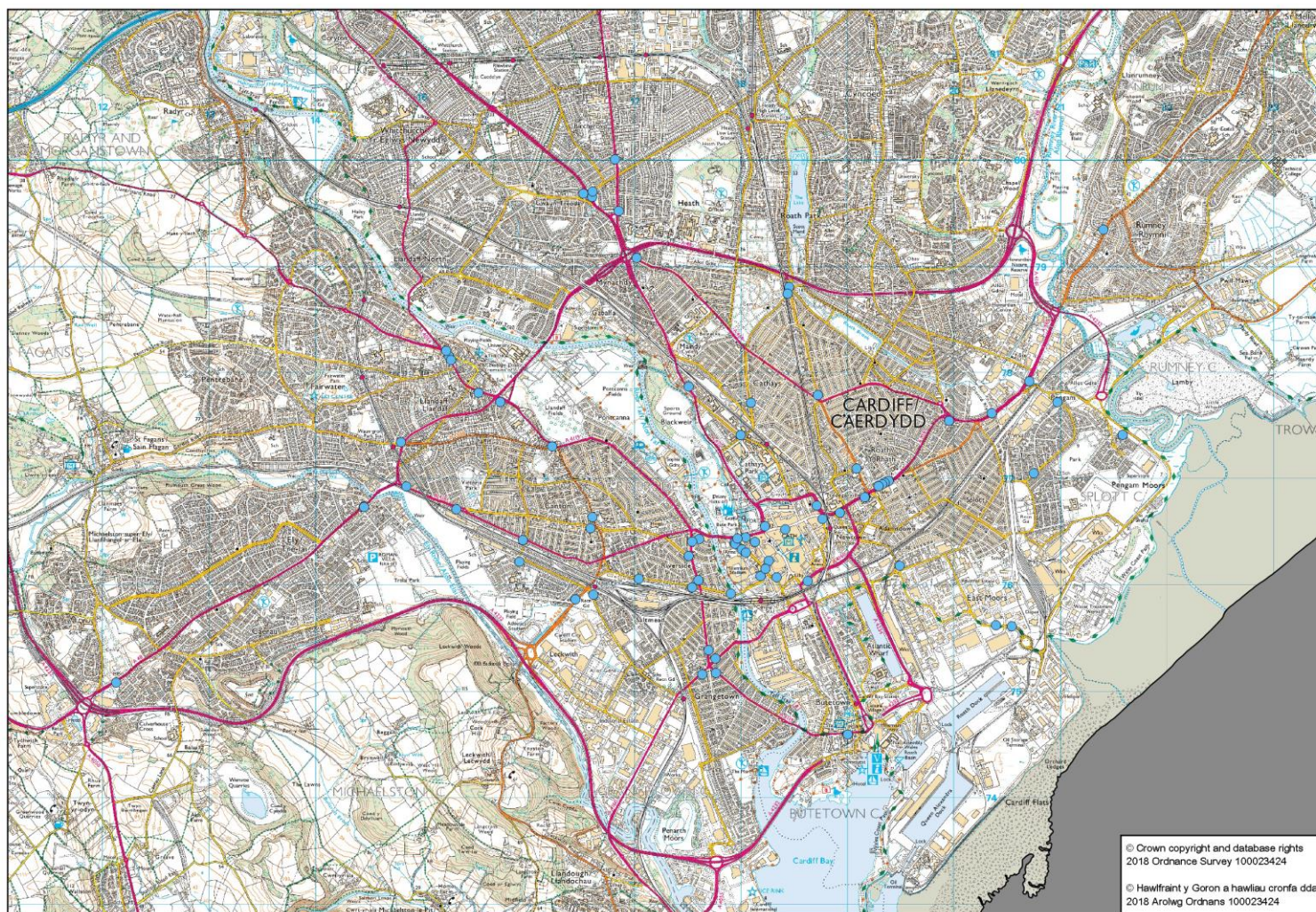




Figure 2.3a- Map Showing Location of Diffusion Tubes in and around the Cardiff City Centre AQMA





**Figure 2.3b- Map Showing Location of Diffusion Tubes in and around the Ely Bridge AQMA**





Figure 2.3c- Map Showing Location of Diffusion Tubes in and around the Stephenson Court AQMA & City Road





Figure 2.3d Map Showing Location of Diffusion Tubes in and around the Llandaff AQMA & Western Avenue





Figure 2.3e- Map Showing Location of Diffusion Tubes in Cathays area & Mackintosh Place

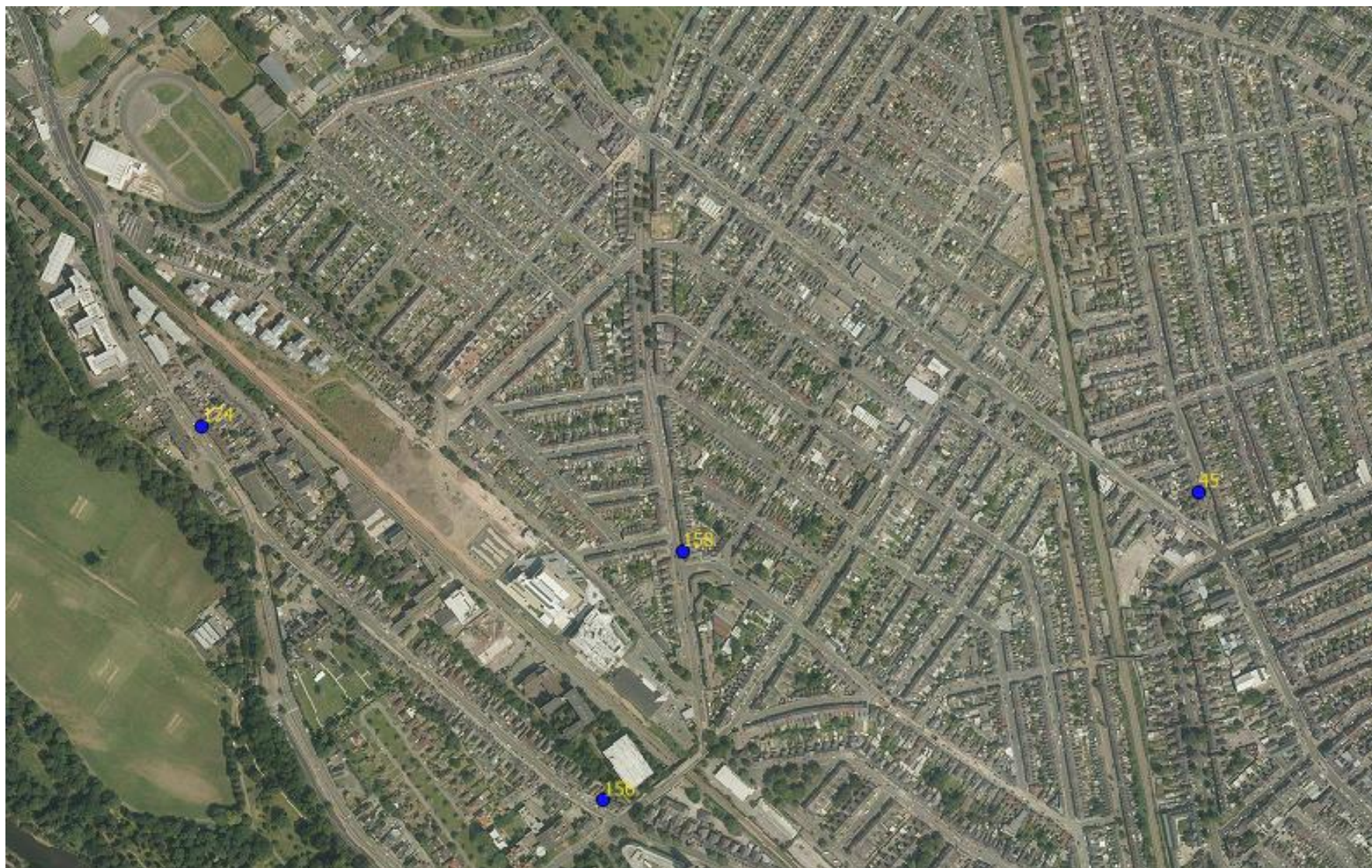
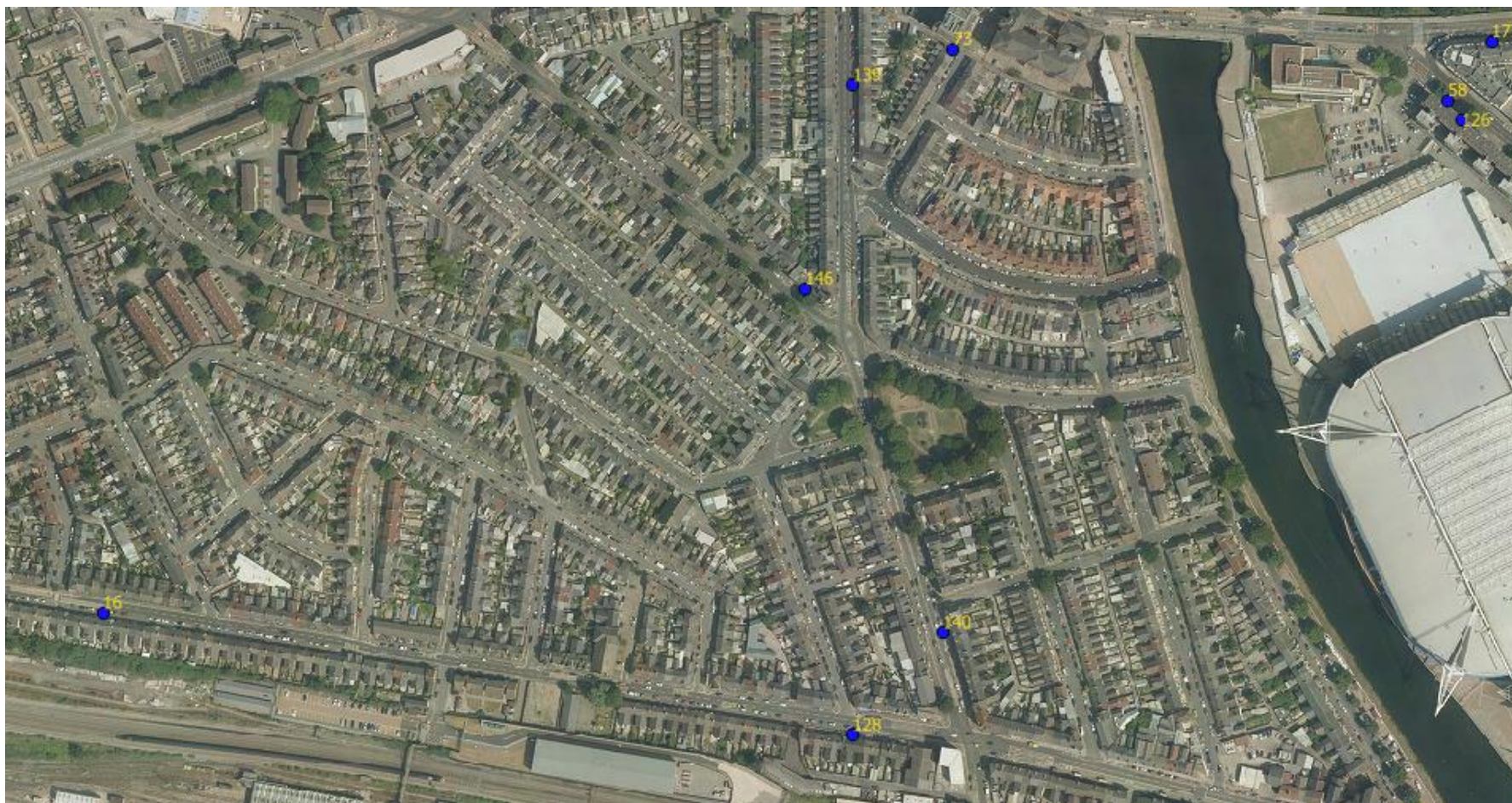




Figure 2.3f- Map Showing Location of Diffusion Tubes in Riverside area





**Figure 2.3g- Map Showing Location of Diffusion Tube at Cowbridge Road West**

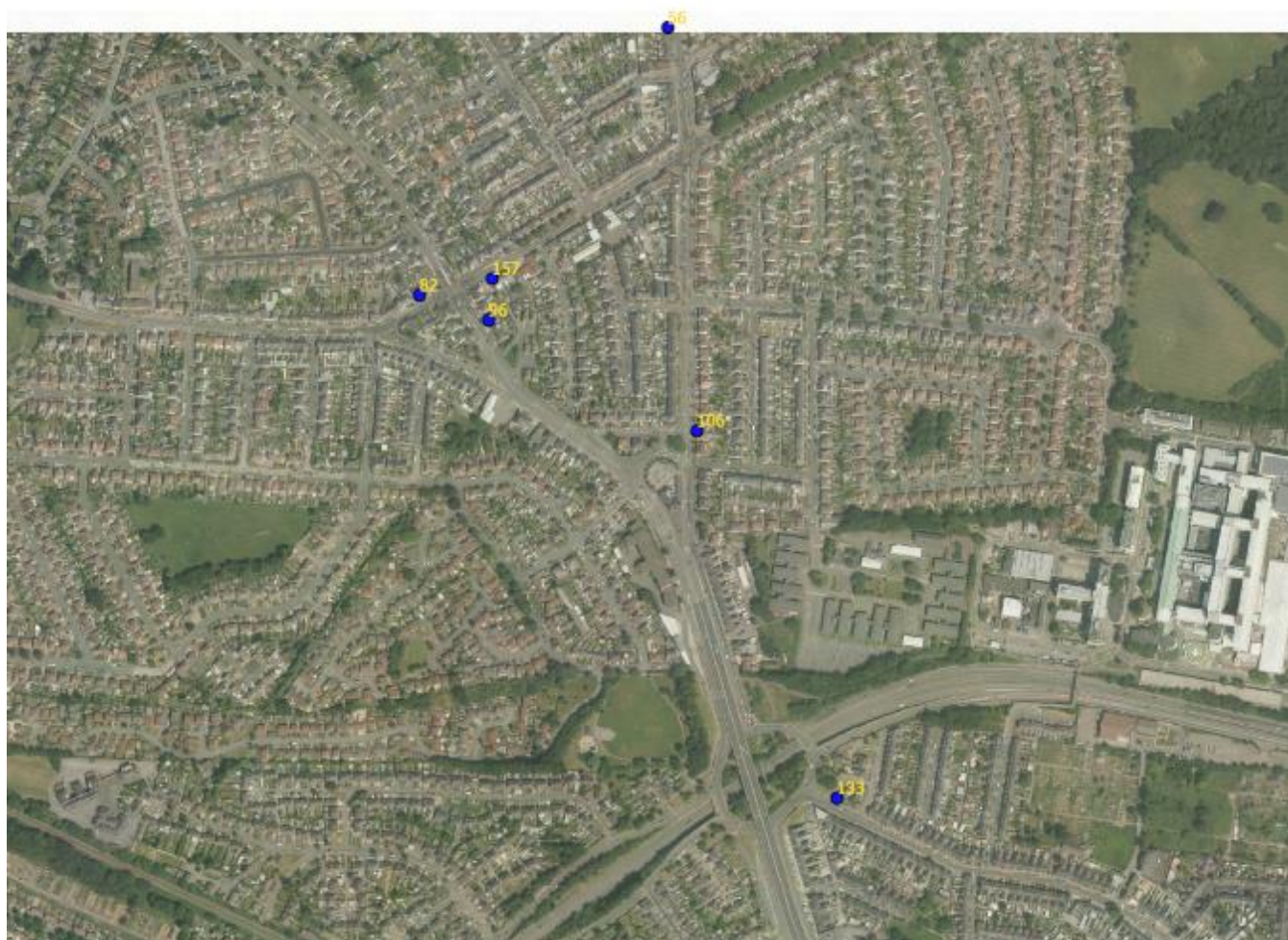




**Figure 2.3h- Map Showing Location of Diffusion Tubes in Fairoak Road**



**Figure 2.3i- Map Showing Location of Diffusion Tubes in Heath area**





**Figure 2.3j- Map Showing Location of Diffusion Tube in James Street**



**Figure 2.3k- Map Showing Location of Diffusion Tubes in Leckwith area**



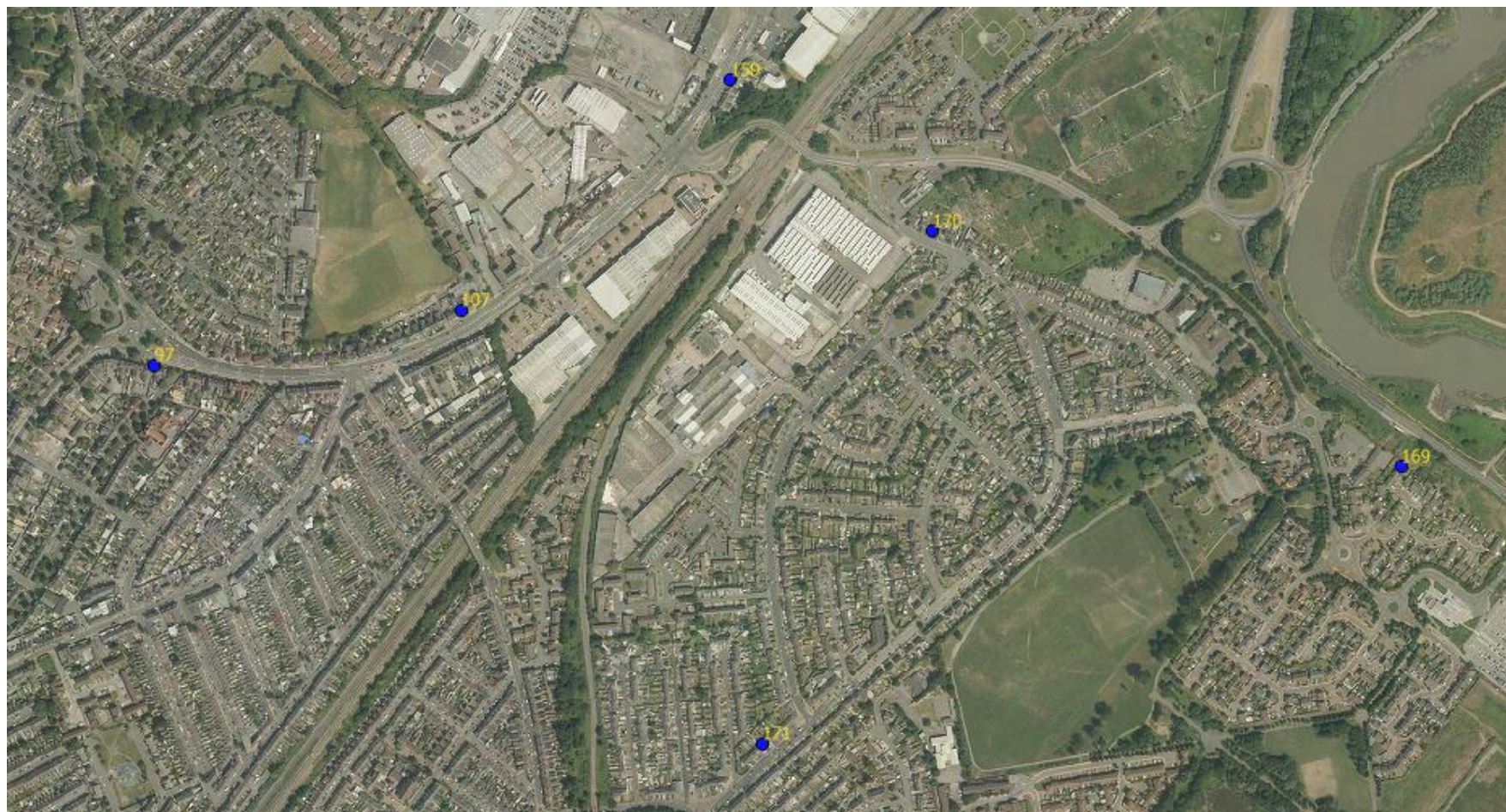


**Figure 2.31- Map Showing Location of Diffusion Tube in East Tyndall Street**



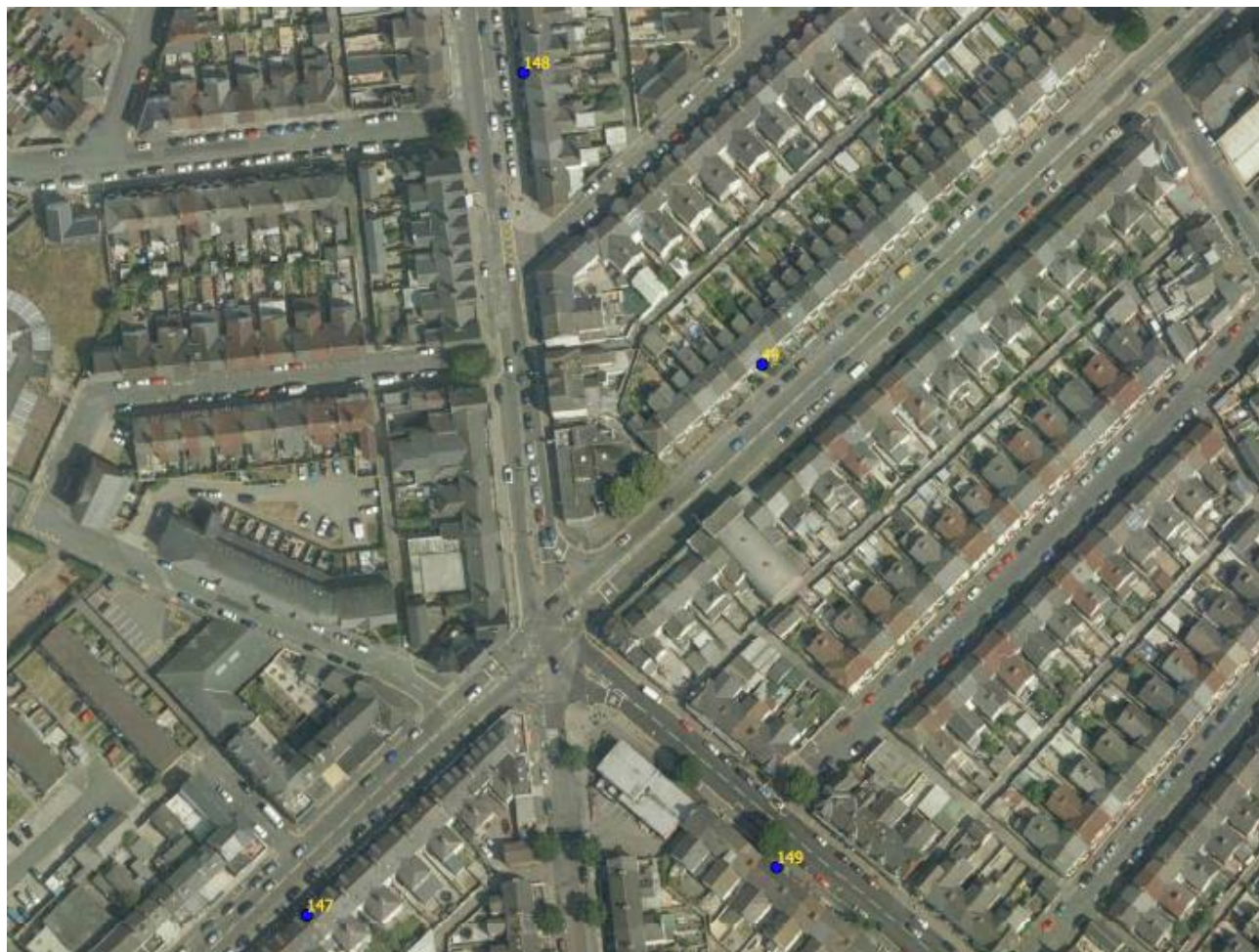


**Figure 2.3m- Map Showing Location of Diffusion Tubes in the Tremorfa Area & Newport Road**





**Figure 2.3n- Map Showing Location of Diffusion Tubes in Penarth Road area**



**Figure 2.3o- Map Showing Location of Diffusion Tubes in Cowbridge Road East and Llandaff Road**





**Figure 2.3p- Map Showing Location of Diffusion Tubes in Ocean Way**





Figure 2.3q- Map Showing Location of Diffusion Tubes in area of former Papermill, Canton



*Area outlined in red is boundary of Ely Bridge AQMA*

**Table 2.2 Details of Non-Automatic Monitoring Sites 2017**

Site ID	Site Name	Site Type	X OS Grid Reference	Y OS Grid Reference	Site Height (m)	Pollutants Monitored	In AQMA?	Is Monitoring Co-located with a Continuous Analyser (Y/N)	Relevant Exposure? (Y/N with distance (m) from monitoring site to relevant exposure)	Distance to Kerb of Nearest Road (m) (N/A if not applicable)	Does this Location Represent Worst-Case Exposure?
16	Ninian Park Road	Roadside	317040	176060	1.5	NO <sub>2</sub>	N	N	Y (0.05m)	5m	Y
33	Mitre Place	Kerbside	315248	178165	3.0	NO <sub>2</sub>	Y	N	N (20m)	1m	Y
44	City Road	Kerbside	319086	177097	3.0	NO <sub>2</sub>	N	N	Y (2m)	1m	Y
45	Mackintosh Place	Kerbside	318722	177788	3.5	NO <sub>2</sub>	N	N	N (3m)	1m	N
47	Ely Bridge	Kerbside	314457	176738	2.5	NO <sub>2</sub>	Y	N	N (2m)	0.25m	Y
49	Penarth Road	Roadside	317760	175310	1.5	NO <sub>2</sub>	N	N	Y (0.05m)	7m	Y
56	Birchgrove Village	Roadside	316816	180005	2.5	NO <sub>2</sub>	N	N	N (10m)	1.5m	Y
58	Westgate Street	Kerbside	317937	176400	2.5	NO <sub>2</sub>	Y	N	N (5m)	0.5m	Y
73	Green Street	Kerbside	317607	176434	2.5	NO <sub>2</sub>	N	N	N (2m)	0.5m	Y
81	Stephenson Court	Roadside	319387	176980	2.0	NO <sub>2</sub>	Y	N	Y (0.05m)	5m	Y
82	104 Birchgrove Road	Roadside	316518	179683	2.0	NO <sub>2</sub>	N	N	Y (0.05m)	5m	Y
85	497 Cowbridge Road West	Roadside	312129	175084	1.5	NO <sub>2</sub>	N	N	Y (0.05m)	5m	Y
86	19 Fair Oak Road	Roadside	318452	178805	1.5	NO <sub>2</sub>	N	N	Y 0.10m)	10m	Y
96	Manor Way Junction	Roadside	316601	179653	1.5	NO <sub>2</sub>	N	N	Y (0.05m)	5m	Y
97	Newport Road (premises)	Roadside	319955	177546	1.5	NO <sub>2</sub>	N	N	Y (0.05m)	10m	Y
98	Western Avenue (premises)	Roadside	314805	177345	1.5	NO <sub>2</sub>	N	N	Y (0.05m)	10m	Y
99	Cardiff Road Llandaff	Roadside	315275	178117	1.5	NO <sub>2</sub>	Y	N	Y (0.05m)	3m	Y
100	188 Cardiff Road	Roadside	316226	177305	1.5	NO <sub>2</sub>	N	N	Y (0.10m)	20m	Y
101	Cardiff Centre AURN	Urban Centre	318416	176525	3.0	NO <sub>2</sub>	N	Y, Triplicate with Tubes 102 & 103	Y (0.10m)	200m	Y
102	Cardiff Centre AURN	Urban Centre	318416	176525	3.0	NO <sub>2</sub>	N	Y, Triplicate with Tubes 101 & 103	Y (0.10m)	200m	Y
103	Cardiff Centre AURN	Urban Centre	318416	176525	3.0	NO <sub>2</sub>	N	Y, Triplicate with Tubes 101 & 102	Y (0.10m)	200m	Y
106	30 Caerphilly Road	Roadside	316851	179520	1.5	NO <sub>2</sub>	N	N	Y (0.05m)	5m	Y
107	Lynx Hotel	Roadside	320356	177618	1.5	NO <sub>2</sub>	N	N	Y (0.05m)	4m	Y
111	98 Leckwith Road	Roadside	316444	175866	1.5	NO <sub>2</sub>	N	N	Y (0.05m)	6m	Y
112	17 Sloper Road	Roadside	316613	175910	1.5	NO <sub>2</sub>	N	N	Y (0.05m)	5m	Y
115	21 Llandaff Road	Roadside	316604	176641	1.5	NO <sub>2</sub>	N	N	Y (0.05m)	3m	Y
117	25 Cowbridge Road West	Roadside	314458	176735	2.0	NO <sub>2</sub>	Y	N	Y (0.05m)	2m	Y
119	Havelock Street	Kerbside	318184	176086	2.0	NO <sub>2</sub>	N	N	N	1m	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?
124	287 Cowbridge Road East	Roadside	316586	17535	1.5	NO <sub>2</sub>	N	N	Y (0.05m)	10m	Y
126	Westgate Street Flats	Roadside	317946	176387	1.5	NO <sub>2</sub>	Y	N	Y (0.10m)	5m	Y
128	117 Tudor Street	Roadside	317540	175979	1.5	NO <sub>2</sub>	N	N	Y (0.05m)	5m	Y
129	Stephenson Court 2	Roadside	319349	176963	1.2	NO <sub>2</sub>	Y	N	Y (3m)	4m	Y
130	Burgess Court	Roadside	319326	176949	2.0	NO <sub>2</sub>	Y	N	Y (0.05m)	5m	Y
131	Dragon Court	Roadside	319292	176932	1.75	NO <sub>2</sub>	Y	N	Y (0.05m)	5m	Y
133	St Mark's Avenue	Roadside	317019	179078	2.0	NO <sub>2</sub>	N	N	Y (21m)	2m	N
134	Sandringham Hotel	Roadside	318261	176229	2.0	NO <sub>2</sub>	Y	N	N (3m)	5m	Y
139	Lower Cathedral Road	Kerbside	317540	176410	2.0	NO <sub>2</sub>	N	N	Y (3m)	1m	Y
140	Clare Street	Kerbside	317600	176047	2.0	NO <sub>2</sub>	N	N	Y (6m)	0.5m	Y
141	Fairoak Road 2	Roadside	318438	178742	2.0	NO <sub>2</sub>	N	N	N (5m)	1.5m	Y
143	Windsor House	Roadside	318009	176337	1.5	NO <sub>2</sub>	Y	N	Y (0.10m)	6.5m	Y
144	Marlborough House	Roadside	318046	176307	1.5	NO <sub>2</sub>	Y	N	Y (0.10m)	6.5m	Y
145	Tudor Street Flats	Roadside	317904	175921	1.5	NO <sub>2</sub>	N	N	Y (0.05m)	4.5m	Y
146	Neville Street	Roadside	317508	176275	2.0	NO <sub>2</sub>	N	N	Y (0.05m)	3.5m	Y
147	211 Penarth Road	Roadside	317636	175161	1.5	NO <sub>2</sub>	N	N	Y (0.10m)	7.0m	Y
148	161 Clare Road	Roadside	317695	175389	1.5	NO <sub>2</sub>	N	N	Y (0.05)	5.0m	Y
149	10 Corporation Road	Roadside	317764	175174	1.5	NO <sub>2</sub>	N	N	Y (0.05)	4.6m	Y
152	James Street	Roadside	319003	174596	1.5	NO <sub>2</sub>	N	N	Y (0.10m)	6.0m	Y
153	Magic Roundabout	Roadside	319491	176183	1.5	NO <sub>2</sub>	N	N	Y (0.10m)	12.5m	Y
156	2a/4 Colum Road	Roadside	317997	177412	1.5	NO <sub>2</sub>	N	N	Y (0.10m)	5.0m	Y
157	47 Birchgrove Road	Roadside	316605	179703	1.5	NO <sub>2</sub>	N	N	Y (0.10m)	8.0m	Y
158	64/66 Cathays Terrace	Roadside	318093	177716	1.5	NO <sub>2</sub>	N	N	Y (0.05m)	3.0m	Y
159	IMO façade replacement	Roadside	320709	177918	1.5	NO <sub>2</sub>	N	N	Y (0.10m)	4.0m	Y
160	High Street Zizzi	Urban Centre	318131	176407	2.0	NO <sub>2</sub>	Y	N	Y (0.10m)	65m	Y
161	52 Bridge Road	Roadside	315230	178205	1.5	NO <sub>2</sub>	Y	N	Y (0.05m)	7.9m	Y
162	58 Cardiff Road	Roadside	315533	177809	1.5	NO <sub>2</sub>	N	N	Y (0.05m)	8.8m	Y
163	118 Cardiff Road	Roadside	315738	177723	1.5	NO <sub>2</sub>	N	N	Y (0.05m)	14.8m	Y
164	725 Newport Road	Roadside	321405	179345	1.5	NO <sub>2</sub>	N	N	Y (0.05m)	6.5m	Y
165	6 Heol Tyrrell	Roadside	315918	176221	1.5	NO <sub>2</sub>	N	N	Y (0.05m)	5.5m	Y
166	163 Lansdowne Road	Roadside	315950	176424	1.5	NO <sub>2</sub>	N	N	Y (0.05m)	5.4m	Y
167	359 Lansdowne Road	Roadside	315326	176714	1.5	NO <sub>2</sub>	N	N	Y (0.05m)	6.1m	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?
168	570 Cowbridge Road East	Roadside	314856	176929	1.5	NO <sub>2</sub>	N	N	Y (0.05m)	4.8m	Y
169	43 Clos Hector	Urban Background	321586	177414	1.5	NO <sub>2</sub>	N	N	Y (0.05m)	43m	Y
170	11 Pengam Green	Roadside	320973	177721	1.5	NO <sub>2</sub>	N	N	Y (0.05m)	9.3m	Y
171	23 Tweedsmuir Road	Roadside	320750	177053	1.5	NO <sub>2</sub>	N	N	Y (0.05m)	10.2m	Y
172	Ocean Way 1	Roadside	320544	175613	2.0	NO <sub>2</sub>	N	N	N (>650m)	1.5m	Y
173	Ocean Way 2	Roadside	320395	175623	2.0	NO <sub>2</sub>	N	N	N (>650m)	1.5m	Y
174	76 North Road	Kerbside	317508	177868	1.5	NO <sub>2</sub>	N	N	Y (0.1m)	1m	Y
179	Altolusso, Bute Terrace	Roadside	318627	176039	2.0	NO <sub>2</sub>	N	N	N (5.1m)	2.1m	N
180	Fitzalan Court, Newport Road	Kerbside	318929	176681	1.8	NO <sub>2</sub>	N	N	N (2.2m)	0.4m	N
181	Windsor House, Windsor Lane	Kerbside	318712	176749	2.0	NO <sub>2</sub>	N	N	N (5.2m)	0.5m	N
182	Admiral House, Newport Road	Roadside	319162	176827	1.5	NO <sub>2</sub>	N	N	N (9.2m)	3.2m	N
183	Station Terrace	Kerbside	318765	176623	2.0	NO <sub>2</sub>	N	N	N (5.5m)	0.5m	Y
184	Hophouse, St Mary Street	Roadside	318335	176074	2.0	NO <sub>2</sub>	Y	N	Y (0.05m)	3.0m	Y
185	Northgate House, Duke Street	Roadside	318224	176554	2.0	NO <sub>2</sub>	N	N	Y (0.05m)	9.65m	Y
186	Dempsey's Public House, Castle Street	Roadside	318044	176449	2.0	NO <sub>2</sub>	Y	N	Y (0.05m)	2.90m	Y
187	Angel Hotel	Roadside	317944	176436	2.0	NO <sub>2</sub>	Y	N	Y (0.05m)	2.85m	Y
188	Westgate Street (45 Apartments)	Roadside	318229	176154	1.8	NO <sub>2</sub>	Y	N	Y (0.05m)	3.30m	Y

**Notes:**

1. 0m if the monitoring site is at a location of exposure (e.g. installed on the façade of a residential property)

## 2.2 2017 Air Quality Monitoring Results

Table 2.1 – Non-automatic Annual Mean NO<sub>2</sub> Monitoring Results (2013- 2017)

Site ID	Site Type	Monitoring Type	Valid Data Capture 2017 (%) <sup>(1)</sup>	Within AQMA?	Annual mean concentration (adjusted for bias) µg/m <sup>3(2)</sup>				
					2013 (Bias Adjustment Factor = 0.85)	2014 (Bias Adjustment Factor = 0.84)	2015 (Bias Adjustment Factor = 0.79)	2016 (Bias Adjustment Factor = 0.78)	2017 (Bias Adjustment Factor = 0.77)
16	Roadside	Diffusion Tube	100	N	31.3	32.4	27.86	28.9	28.9
33	Kerbside	Diffusion Tube	100	Y	<b>49.6</b>	<b>51.2</b>	<b>46.94</b>	<b>47.6</b>	33.0
44	Kerbside	Diffusion Tube	92	N	33.2	29.7	27.08	31.3	31.5
45	Kerbside	Diffusion Tube	92	N	36.8	37.8	32.09	36.0	35.5
47	Kerbside	Diffusion Tube	58	Y	<b>48.0</b>	<b>47.1</b>	<b>41.35</b>	<b>49.7</b>	<b>48.2<sup>2</sup></b>
49	Roadside	Diffusion Tube	100	N	32.1	32.6	29.35	30.4	27.7
56	Roadside	Diffusion Tube	100	N	35.4	35.8	29.64	32.5	27.8
58	Kerbside	Diffusion Tube	67	Y	<b>52.4</b>	<b>51.2</b>	<b>48.25</b>	<b>45.3</b>	<b>44.5<sup>2</sup></b>
73	Kerbside	Diffusion Tube	100	N	24.9	26.8	22.05	24.4	21.0
81	Roadside	Diffusion Tube	100	Y	37.2	36.4	35.29	37.6	35.9

Site ID	Site Type	Monitoring Type	Valid Data Capture 2017 (%) <sup>(1)</sup>	Within AQMA?	Annual mean concentration (adjusted for bias) $\mu\text{g}/\text{m}^3$ <sup>(2)</sup>				
					2013 (Bias Adjustment Factor = 0.85)	2014 (Bias Adjustment Factor = 0.84)	2015 (Bias Adjustment Factor = 0.79)	2016 (Bias Adjustment Factor = 0.78)	2017 (Bias Adjustment Factor = 0.77)
82	Roadside	Diffusion Tube	100	N	32.1	27.6	23.79	28.4	24.5
85	Roadside	Diffusion Tube	100	N	26.7	27.2	22.36	26.8	25.3
86	Roadside	Diffusion Tube	100	N	38.8	38.9	34.85	35.6	37.0
96	Roadside	Diffusion Tube	100	N	35.5	34.4	31.05	36.9	31.8
97	Roadside	Diffusion Tube	100	N	34.5	33.6	30.49	31.2	28.8
98	Roadside	Diffusion Tube	100	N	28.3	29.8	25.44	28.4	26.2
99	Roadside	Diffusion Tube	100	Y	38.9	39.6	29.84	34.8	31.0
100	Roadside	Diffusion Tube	100	N	32.6	31.8	28.86	30.3	29.5
101	Urban Centre	Diffusion Tube	50	N	26.5	24.4	20.28	23.1	21.3
102	Urban Centre	Diffusion Tube	50	N	26.9	24.2	21.06	22.5	20.9
103	Urban Centre	Diffusion Tube	50	N	26.2	24.4	20.72	23.2	21.6
106	Roadside	Diffusion Tube	100	N	34.8	34.9	29.41	32.2	31.5

Site ID	Site Type	Monitoring Type	Valid Data Capture 2017 (%) <sup>(1)</sup>	Within AQMA?	Annual mean concentration (adjusted for bias) $\mu\text{g}/\text{m}^3$ <sup>(2)</sup>				
					2013 (Bias Adjustment Factor = 0.85)	2014 (Bias Adjustment Factor = 0.84)	2015 (Bias Adjustment Factor = 0.79)	2016 (Bias Adjustment Factor = 0.78)	2017 (Bias Adjustment Factor = 0.77)
107	Roadside	Diffusion Tube	67	N	34.6	34.8	30.70	35 <sup>2</sup>	32.6 <sup>2</sup>
111	Roadside	Diffusion Tube	100	N	25.2	24.7	21.34	23.3	20.1
112	Roadside	Diffusion Tube	100	N	30.7	28.8	27.06	29.5	27.4
115	Roadside	Diffusion Tube	100	N	35.5	36.3	32.47	32.8	32.7
117	Roadside	Diffusion Tube	100	Y	<b>44.9</b>	<b>42.3</b>	39.54	<b>41.3</b>	38.0
119	Kerbside	Diffusion Tube	67	N	33.2	32.0	27.65	29.9	33.2 <sup>2</sup>
124	Roadside	Diffusion Tube	100	N	26.1	26.3	22.48	24.2	23.9
126	Roadside	Diffusion Tube	67	Y	<b>44.0</b>	<b>41.2</b>	36.00	38.4	39.4 <sup>2</sup>
128	Roadside	Diffusion Tube	100	N	34.7	36.5	29.57	31.2	29.8
129	Roadside	Diffusion Tube	100	Y	32.8	32.0	31.45	31.1	30.8
130	Roadside	Diffusion Tube	100	Y	39.0	38.9	35.23	37.8	38.5
131	Roadside	Diffusion Tube	100	Y	<b>43.9</b>	<b>41.2</b>	39.48	39.6	<b>41.7</b>

Site ID	Site Type	Monitoring Type	Valid Data Capture 2017 (%) <sup>(1)</sup>	Within AQMA?	Annual mean concentration (adjusted for bias) $\mu\text{g}/\text{m}^3$ <sup>(2)</sup>				
					2013 (Bias Adjustment Factor = 0.85)	2014 (Bias Adjustment Factor = 0.84)	2015 (Bias Adjustment Factor = 0.79)	2016 (Bias Adjustment Factor = 0.78)	2017 (Bias Adjustment Factor = 0.77)
133	Roadside	Diffusion Tube	100	N	37.8	37.5	31.89	35.7	36.8
134	Roadside	Diffusion Tube	50	Y	33.4 <sup>a</sup>	34.5	32.07	38.2 <sup>a</sup>	37.3 <sup>2</sup>
139	Kerbside	Diffusion Tube	100	N	34.1	35.5	29.42	31.1	29.0
140	Kerbside	Diffusion Tube	100	N	<b>42.2</b>	<b>42.9</b>	36.32	37.3	35.2
141	Roadside	Diffusion Tube	100	N	37.7	37.0	32.28	36.3 <sup>2</sup>	34.5
143	Roadside	Diffusion Tube	67	Y	<b>42.1</b>	<b>42.1</b>	38.16	38.7	38.4 <sup>2</sup>
144	Roadside	Diffusion Tube	67	Y	39.0	38.2	37.22	38.3	36.8 <sup>2</sup>
145	Roadside	Diffusion Tube	83	N	34.5	32.6	29.90	29.9	29.6
146	Roadside	Diffusion Tube	100	N	30.9	29.7	26.57	27.5	26.8
147	Roadside	Diffusion Tube	100	N	32.0	31.3	27.70	28.8	26.2
148	Roadside	Diffusion Tube	100	N	29.3	29.1	27.53	29.2	27.3
149	Roadside	Diffusion Tube	100	N	34.5	33.2	33.56	31.2	32.5

Site ID	Site Type	Monitoring Type	Valid Data Capture 2017 (%) <sup>(1)</sup>	Within AQMA?	Annual mean concentration (adjusted for bias) $\mu\text{g}/\text{m}^3$ <sup>(2)</sup>				
					2013 (Bias Adjustment Factor = 0.85)	2014 (Bias Adjustment Factor = 0.84)	2015 (Bias Adjustment Factor = 0.79)	2016 (Bias Adjustment Factor = 0.78)	2017 (Bias Adjustment Factor = 0.77)
152	Roadside	Diffusion Tube	100	N	31.0	29.7	27.60	29.3	28.9
153	Roadside	Diffusion Tube	100	N	33.0	33.2	28.99	30.1	30.6
156	Roadside	Diffusion Tube	100	N	34.9	31.4	25.92	29.7	25.7
157	Roadside	Diffusion Tube	100	N	29.0	29.7	27.16	28.2	28.3
158	Roadside	Diffusion Tube	100	N	30.2	29.1	25.50	29.0	26.1
159	Roadside	Diffusion Tube	100	N	38.8	39.2	33.96	35.5	38.6
160	Urban Centre	Diffusion Tube	67	Y	30.3	28.3	27.03	31.7	28.1 <sup>2</sup>
161	Roadside	Diffusion Tube	75	Y	39.1	37.2	32.28	35.0	33.4
162	Roadside	Diffusion Tube	100	N	27.6	27.6	24.47	26.1	24.0
163	Roadside	Diffusion Tube	92	N	25.4	28.2	23.22	25.7	24.8
164	Roadside	Diffusion Tube	100	N	25.4	23.9	20.31	20.0	22.4
165	Roadside	Diffusion Tube	100	N	19.4	17.4	15.10	17.0	15.2

Site ID	Site Type	Monitoring Type	Valid Data Capture 2017 (%) <sup>(1)</sup>	Within AQMA?	Annual mean concentration (adjusted for bias) $\mu\text{g}/\text{m}^3$ <sup>(2)</sup>				
					2013 (Bias Adjustment Factor = 0.85)	2014 (Bias Adjustment Factor = 0.84)	2015 (Bias Adjustment Factor = 0.79)	2016 (Bias Adjustment Factor = 0.78)	2017 (Bias Adjustment Factor = 0.77)
166	Roadside	Diffusion Tube	100	N	34.9	36.6	32.05	33.2	32.1
167	Roadside	Diffusion Tube	100	N	31.7	31.5	28.26	29.8	26.9
168	Roadside	Diffusion Tube	100	N	27.9	27.7	24.26	27.7	26.2
169	Urban Centre	Diffusion Tube	100	N	18.0	18.1	16.27	18.4	16.2
170	Roadside	Diffusion Tube	92	N	22.1	21.9	19.08	21.9	21.0
171	Roadside	Diffusion Tube	100	N	22.5	20.8	18.06	22.0	19.7
172	Roadside	Diffusion Tube	92	N	<b>49.5</b>	<b>47.8</b>	<b>44.50</b>	<b>48.8</b>	<b>43.5</b>
173	Roadside	Diffusion Tube	100	N	33.7	33.3	28.40	28.7 <sup>2</sup>	29.6
174	Kerbside	Diffusion Tube	100	N	-	33.9	28.65	33.3	27.5
179	Roadside	Diffusion Tube	50	N	-	-	-	39.7 <sup>2</sup>	<b>45.4<sup>2</sup></b>
180	Kerbside	Diffusion Tube	42	N	-	-	-	<b>48.1<sup>2</sup></b>	<b>49.1<sup>2</sup></b>
181	Kerbside	Diffusion Tube	42	N	-	-	-	<b>43.3</b>	<b>40.5<sup>2</sup></b>

Site ID	Site Type	Monitoring Type	Valid Data Capture 2017 (%) <sup>(1)</sup>	Within AQMA?	Annual mean concentration (adjusted for bias) $\mu\text{g}/\text{m}^3$ <sup>(2)</sup>				
					2013 (Bias Adjustment Factor = 0.85)	2014 (Bias Adjustment Factor = 0.84)	2015 (Bias Adjustment Factor = 0.79)	2016 (Bias Adjustment Factor = 0.78)	2017 (Bias Adjustment Factor = 0.77)
182	Roadside	Diffusion Tube	92	N	-	-	-	33.6	33.5
183	Kerbside	Diffusion Tube	83	N	-	-	-	35.9	31.2
184	Roadside	Diffusion Tube	50	Y	-	-	-	<b>41.4</b>	38.7 <sup>2</sup>
185	Roadside	Diffusion Tube	42	N	-	-	-	37.1	28.6 <sup>2</sup>
186	Roadside	Diffusion Tube	50	Y	-	-	-	<b>47.5</b>	<b>47.7<sup>2</sup></b>
187	Roadside	Diffusion Tube	58	Y	-	-	-	<b>50.7</b>	<b>50.2<sup>2</sup></b>
188	Roadside	Diffusion Tube	50	Y	-	-	-	<b>49.8<sup>2</sup></b>	<b>49.8<sup>2</sup></b>

**Notes:**

Exceedances of the NO<sub>2</sub> annual mean objective of 40 $\mu\text{g}/\text{m}^3$  are shown in **bold**.

NO<sub>2</sub> annual means exceeding 60 $\mu\text{g}/\text{m}^3$ , indicating a potential exceedance of the NO<sub>2</sub> 1-hour mean objective are shown in **bold and underlined**.

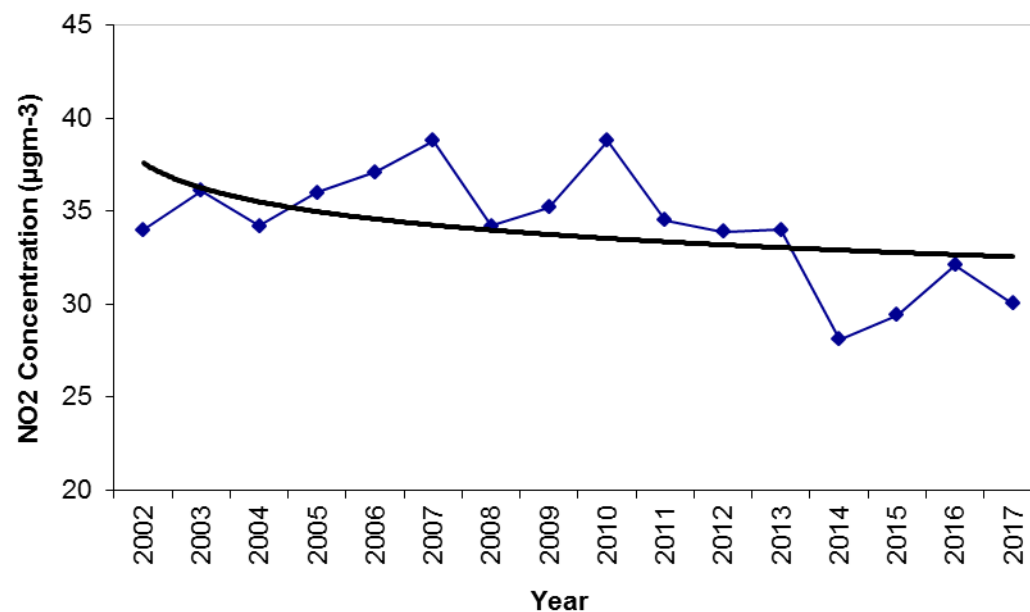
(1) Data capture for the full calendar year (e.g. if monitoring was carried out for 6 months, the maximum data capture for the full calendar year is 50%).

(2) Diffusion tube data has been “bias adjusted” in accordance with Box 7.11 in LAQM.TG16 and “annualised” as per Boxes 7.9 and 7.10 in LAQM.TG16 if valid data capture for the full calendar year is less than 75%. See Appendix C for details.

(3) Diffusion tube data has been corrected for distance to represent relevant exposure in accordance with Sections 7.77- 7.79 in LAQM.TG16 “Fall-off in NO<sub>2</sub> concentrations with Distance from the Road”



**Figure 2.4 – Trends in Annual Mean NO<sub>2</sub> Concentrations Measured at Long- Term Standing Diffusion Tube Monitoring Sites**



The graph represents annual average bias corrected NO<sub>2</sub> data since 2002 at long-term standing diffusion tube monitoring locations. The displayed average datasets indicate **compliant** NO<sub>2</sub> results for 2017. The results are somewhat stable with a slightly decreasing trend evident.

**Table 2.4 – Automatic Annual Mean NO<sub>2</sub> Monitoring Results (2013- 2017)**

Site ID	Site Type	Within AQMA?	Valid Data Capture for Monitoring Period % <sup>(1)</sup>	Valid Data Capture 2017 % <sup>(2)</sup>	Annual Mean Concentration (µg/m <sup>3</sup> )				
					2013	2014	2015	2016	2017
Cardiff Centre AURN	Urban Background	N	100	99	26	25	27	23	20

Notes:

Exceedances of the Annual Average NO<sub>2</sub> objective (40µg/m<sup>3</sup>) are shown in bold.

(1) Data capture for the monitoring period, in cases where monitoring was only carried out for part of the year.

(2) Data capture for the full calendar year (e.g. if monitoring was carried out for 6 months, the maximum data capture for the full calendar year is 50%).

(3) Data has been “annualised” as per Boxes 7.9 in LAQM.TG16 where valid data capture for the full calendar year is less than 75%. See Appendix C for details.

**Table 2.5 –Automatic 1-hour Mean NO<sub>2</sub> Monitoring Results (2013- 2017)**

Site ID	Site Type	Within AQMA?	Valid Data Capture for Monitoring Period % <sup>(1)</sup>	Valid Data Capture 2017 % <sup>(2)</sup>	Number of Hourly Means (> 200µg/m <sup>3</sup> ) <sup>(3)</sup>				
					2013	2014	2015	2016	2017
Cardiff Centre AURN	Urban Background	N	100	99	5	0	0 (14.98)	0	0

Notes:

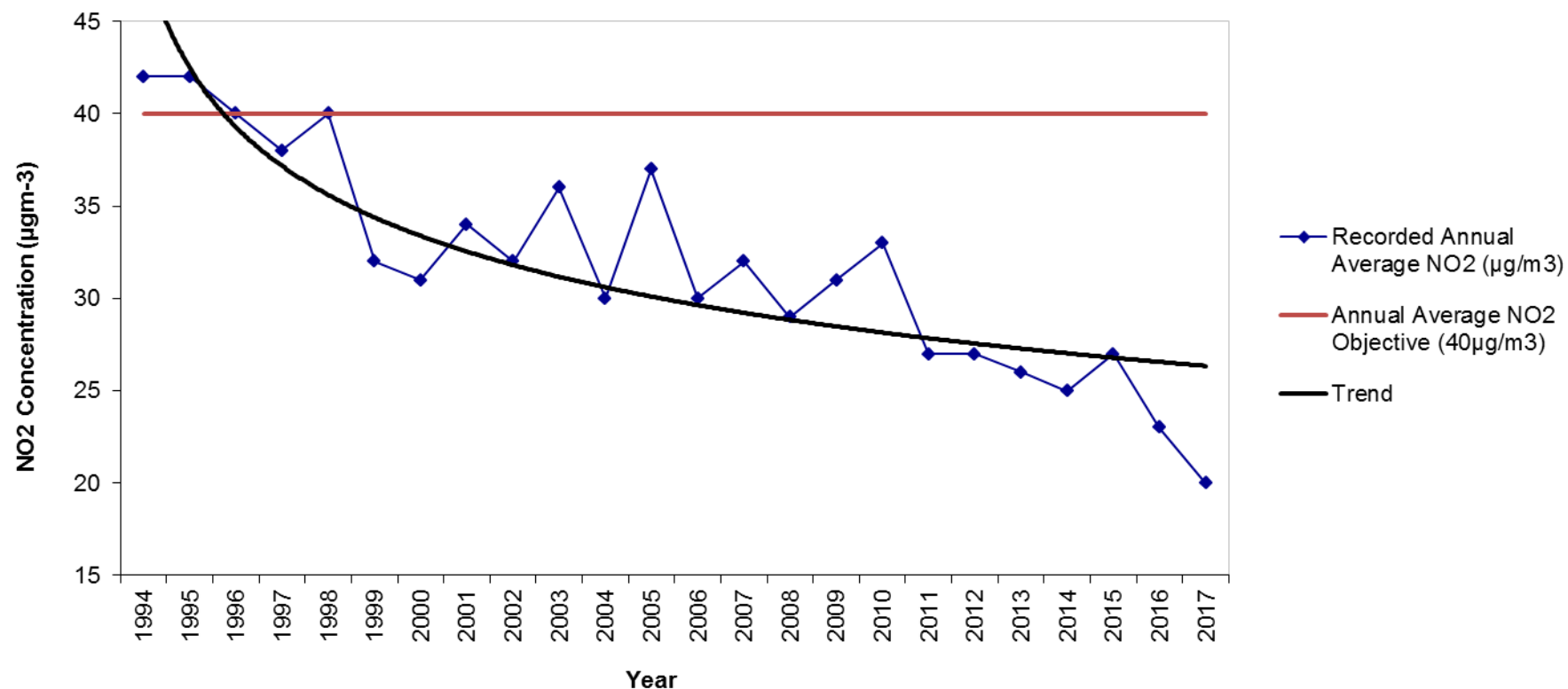
Exceedances of the NO<sub>2</sub> 1-hour mean objective (200µg/m<sup>3</sup> not to be exceeded more than 18 times/year) are shown in bold.

(1) Data capture for the monitoring period, in cases where monitoring was only carried out for part of the year.

(2) Data capture for the full calendar year (e.g. if monitoring was carried out for 6 months, the maximum data capture for the full calendar year is 50%).

(3) If the period of valid data is less than 85%, the 99.8<sup>th</sup> percentile of 1-hour means is provided in brackets.

**Figure 2.5 – Trends in Annual Mean NO<sub>2</sub> Concentrations Measured at Cardiff Frederick Street AURN Site**



**Figure 2.5** indicates a decreasing trend in annual average NO<sub>2</sub> concentrations in Cardiff's background levels. It must be noted that 2017 marks the lowest annual average value recorded value of 20µg/m<sup>3</sup>.

**Table 2.6 – Automatic Annual Mean PM<sub>10</sub> Monitoring Results (2013- 2017)**

Site ID	Site Type	Within AQMA?	Valid Data Capture for Monitoring Period (%) <sup>(1)</sup>	Valid Data Capture 2017 (%) <sup>(2)</sup>	Confirm Gravimetric Equivalent (Y or N/A)	PM <sub>10</sub> Annual Mean Concentration (µg/m <sup>3</sup> ) <sup>(3)</sup>				
						2013	2014	2015	2016	2017
Cardiff Centre AURN	Urban Background	N	100	91	N/A	19	16	16	15.1 <sup>(3)</sup>	15.9

**Notes:**

Exceedances of the PM<sub>10</sub> annual mean objective of 40µg/m<sup>3</sup> are shown in bold.

(1) Data capture for the monitoring period, in cases where monitoring was only carried out for part of the year.

(2) Data capture for the full calendar year (e.g. if monitoring was carried out for 6 months, the maximum data capture for the full calendar year is 50%).

(3) Data has been “annualised” as per Boxes 7.9 and 7.10 in LAQM.TG16 where valid data capture for the full calendar year is less than 75%. See Appendix C for details.

**Table 2.7 – Automatic 24-Hour Mean PM<sub>10</sub> Monitoring Results (2013- 2017)**

Site ID	Site Type	Within AQMA?	Valid Data Capture for Monitoring Period (%) <sup>(1)</sup>	Valid Data Capture 2017 (%) <sup>(2)</sup>	Confirm Gravimetric Equivalent (Y or N/A)	Number of Daily Means > 50µg/m <sup>3</sup> <sup>(3)</sup>				
						2013	2014	2015	2016	2017
Cardiff Centre AURN	Urban Background	N	100	91	N/A	3	4	5 (25.4)	1 (30.52)	2

**Notes:**

Exceedances of the PM<sub>10</sub> 24-hour mean objective (50µg/m<sup>3</sup> not to be exceeded more than 35 times/year) are shown in **bold**.

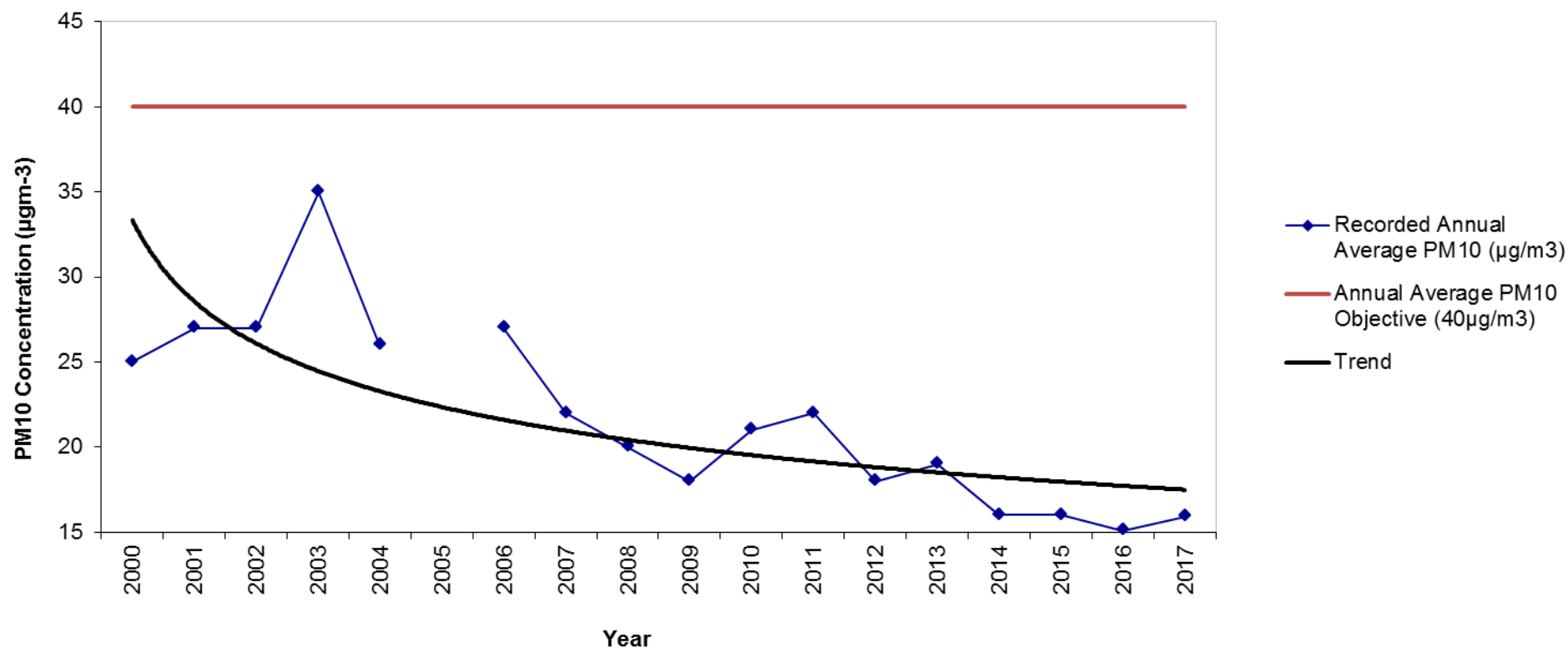
(1) Data capture for the monitoring period, in cases where monitoring was only carried out for part of the year.

(2) Data capture for the full calendar year (e.g. if monitoring was carried out for 6 months, the maximum data capture for the full calendar year is 50%).

(3) If the period of valid data is less than 85%, the 90.4<sup>th</sup> percentile of 24-hour means is provided in brackets.



**Figure 2.6 – Trends in Annual Mean PM<sub>10</sub> Concentrations Measured at Cardiff Frederick Street AURN Site**



The displayed datasets indicate a downward trend in Cardiff's background PM<sub>10</sub> levels.

**Table 2.8 – Automatic SO<sub>2</sub> Monitoring Results: Comparison with Objectives**

Site ID	Site Type	Within AQMA?	Valid Data Capture for Monitoring Period (%) <sup>(1)</sup>	Valid Data Capture 2017 (%) <sup>(2)</sup>	Number of Exceedences (percentile in bracket µg/m <sup>3</sup> )		
					15-minute Objective (266 µg/m <sup>3</sup> )	1-hour Objective (350 µg/m <sup>3</sup> )	24-hour Objective (125 µg/m <sup>3</sup> )
Cardiff Centre AURN	Urban Background	N	100	94.1	0	0	0

**Notes:**

Exceedences of the SO<sub>2</sub> mean objectives are shown in **bold**.

(1) Data capture for the monitoring period, in cases where monitoring was only carried out for part of the year.

(2) Data capture for the full calendar year (e.g. if monitoring was carried out for 6 months, the maximum data capture for the full calendar year is 50%).

(3) In accordance with LAQM TG(16), due to the fact data capture is <85% it is a requirement to report the 99.9<sup>th</sup> percentile for 15 minute SO<sub>2</sub>, however in this instance it is the 99.9<sup>th</sup> percentile for 10 minute SO<sub>2</sub>.

(4) In accordance with LAQM TG(16), due to the fact data capture is <85% it is a requirement to report the 99.7<sup>th</sup> percentile for 1 hour SO<sub>2</sub>.

(5) In accordance with LAQM TG(16), due to the fact data capture is <85% it is a requirement to report the 99.2<sup>nd</sup> percentile for 24 hour SO<sub>2</sub>.

**Table 2.9 – Automatic Carbon Monoxide (CO) Monitoring Results: Comparison with Objectives**

Site ID	Site Type	Within AQMA?	Valid Data Capture for Monitoring Period (%) <sup>(1)</sup>	Valid Data Capture 2017 (%) <sup>(2)</sup>	Number of Exceedences
					8-Hour Average Objective (10 µg/m <sup>3</sup> )
Cardiff Centre AURN	Urban Background	N	100	99.1	0

**Table 2.10 – Automatic Ozone (O<sub>3</sub>) Monitoring Results: Comparison with Objectives**

Site ID	Site Type	Within AQMA?	Valid Data Capture for Monitoring Period (%) <sup>(1)</sup>	Valid Data Capture 2017 (%) <sup>(2)</sup>	Number of Exceedences
					Number of days where the 8-hour mean >100µg/m <sup>3</sup>
Cardiff Centre AURN	Urban Background	N	100	97.5	3

## 2.3 Comparison of 2017 Monitoring Results with Previous Years and the Air Quality Objectives

During 2017 monitoring was carried out for nitrogen dioxide (NO<sub>2</sub>), particulate matter (PM<sub>10</sub>), sulphur dioxide (SO<sub>2</sub>), carbon monoxide (CO) and ozone (O<sub>3</sub>). There was no monitoring undertaken for benzene or 1-3-butadiene.

### 2.3.1 Nitrogen Dioxide (NO<sub>2</sub>)

Nitrogen dioxide was measured during 2017 at one site equipped with an automatic NO<sub>x</sub> analyser and by a network of 77 passive diffusion tubes.

In order to ratify the 2017 diffusion tube dataset, a bias adjustment factor of 0.77 was applied to the annual average readings. The factor was derived from the Defra website which gave the average correction factor from 29 co-location studies across the UK, whereby the analytical laboratory and method used was the same as CC. The national bias correction factor was utilized as it would provide results representative of a worst case scenario. The bias correction factor of 0.77 was obtained from the following website: <http://laqm.defra.gov.uk/bias-adjustment-factors/national-bias.html>

#### Automatic Monitoring Data

Monitoring of NO<sub>2</sub> has continued to be carried out at the Cardiff City Centre Frederick AURN site. As previously discussed, April 2018 saw an additional AURN site implemented on Richard's Terrace just off Newport Road, Cardiff.

Datasets obtained from the Frederick Street AURN site have been cross referenced to the annual and 1-hour average objectives set for NO<sub>2</sub>. The findings summarised in **Tables 2.4 & 2.5** indicate compliance with both objectives.

#### Non- automated Monitoring Data

The nitrogen dioxide diffusion tube data is summarised in **Table 2.3**. The full dataset (raw monthly mean values) is included in Appendix A. All data displayed in **Table 2.3** has been bias adjusted and where necessary annualised in accordance with Box 7.10 of LAQM TG(16). Evidence of the sites annualised can be seen in Appendix C. The applied bias adjustment factor was 0.77, as described in Appendix C.



Table 2.3 shows that 10 of the 77 passive diffusion tubes recorded a concentration of NO<sub>2</sub> above the 40µg/m<sup>3</sup> annual mean Objective in 2017. Of these 10 sites, 6 are inside one of the four established AQMAs.

Sites 172, 179, 180, 181 are not currently in an AQMA where the measured annual average concentration of NO<sub>2</sub> was above the 40µg/m<sup>3</sup> annual mean objective in 2017. However, there is reasoning for these recorded exceedences;

Site 172 is placed on Ocean Way to monitor potential impacts of traffic resulting from industrial developments in the area. The site is not representative of relevant exposure, the nearest being >650m away. For 2018 Site 172 has been revoked from the monitoring network as it is felt that a strong trend of data has been collected at this location.

Site 179 is representative of the short-term 1-hour NO<sub>2</sub> objective **only**.

Sites 180 & 181 were implemented due to new developments with the potential for adverse air quality impacting the amenity of future occupants (Windsor House, Windsor Lane & Fitzalan Court, Newport Road). Both developments commenced construction in 2016, through into 2017, therefore influencing any datasets recorded. At the time of writing this report Section 106 contributions have been accepted via the planning system for the Fitzalan Court development. With the use of the s106 contributions an indicative real time monitor has been purchased to examine air quality levels, particularly NO<sub>2</sub> concentrations. Following relevant quality checks involving a comparison study with an approved quality checked real time monitoring site, it is envisaged for the monitor to be installed by the end of 2018.

Sites 186, 187, 188 are not representative of the locality associated with the annual mean objective set for NO<sub>2</sub>. At each monitoring location there is no residential accommodation located at ground floor level. Where residential accommodation is present at these monitoring locations, it is located >3m above ground floor level. Therefore, datasets collected at these monitoring locations apply to the 1-hour objective set for NO<sub>2</sub>.

Although CCC does have a commitment to achieving NO<sub>2</sub> levels as low as reasonably practical, targets must be set and therefore there is an agreement that **annual average** concentration levels <35µg/m<sup>3</sup> are to be attained within all AQMA areas at locations which represent the specified locality of the air quality objective.

Sites 45, 133 & 140 outline elevated annual average levels for NO<sub>2</sub>. For 2018 these monitoring locations have been amended and improved whereby the locality of the annual objective is preferred.

Sites 86 and 159 display increased levels in annual average NO<sub>2</sub> with annual readings recorded as;

Sites 86- 37.0µg/m<sup>3</sup>

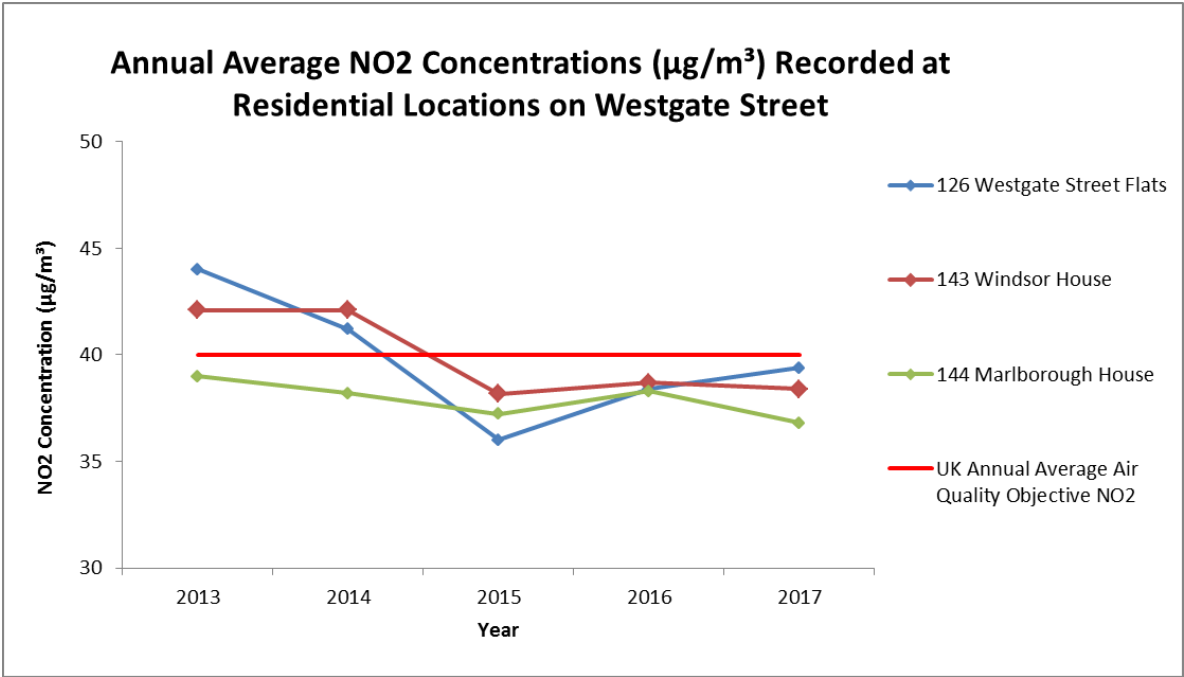
Site 159- 38.6µg/m<sup>3</sup>

It has been suggested that these sites are susceptible to further examination following a review of 2018's complete dataset.

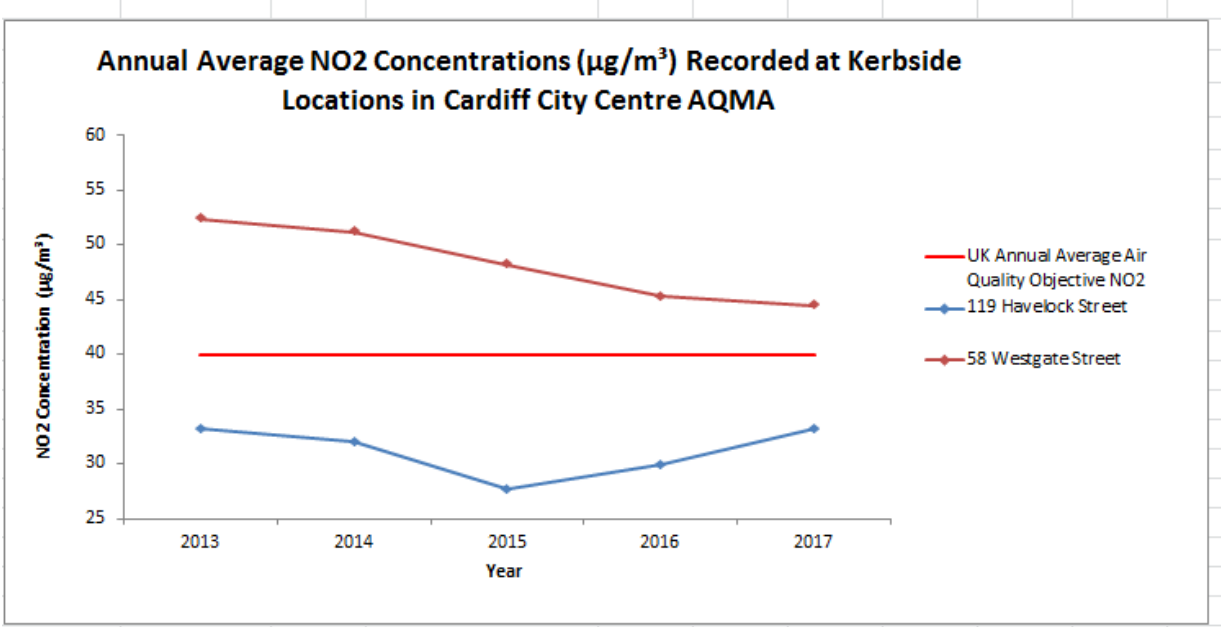
In 2018 the existing monitoring network has been sufficiently review with 23 new locations implemented.

Examining Tables 2.3 & Figures 2.7/2.8, it is apparent that annual average NO<sub>2</sub> datasets in the City Centre, in and around the AQMA, continue to be elevated in 2017 showing little evidence of improvement from the 2016 datasets. Annual levels of NO<sub>2</sub> at residential accommodation on Westgate Street (Sites 126, 143 & 144) are approaching the objective with concentrations >38µg/m<sup>3</sup>. Figure 2.8 represents kerbside monitoring locations used to examine traffic flow patterns and associated air quality levels. The graph shows little improvement in levels, in fact an increase in levels has been recorded at the monitoring site on Havelock Street.

**Figure 2.7- Trends in Annual Average NO<sub>2</sub> Concentrations Recorded at Façade Locations on Westgate Street**



**Figure 2.8- Trends in Annual Average NO<sub>2</sub> Concentrations Recorded at Kerbside Locations in Cardiff City Centre**



Monitoring undertaken within the Ely Bridge AQMA, at the façade of residential property (Site 117) indicates improved but still considered elevated levels.

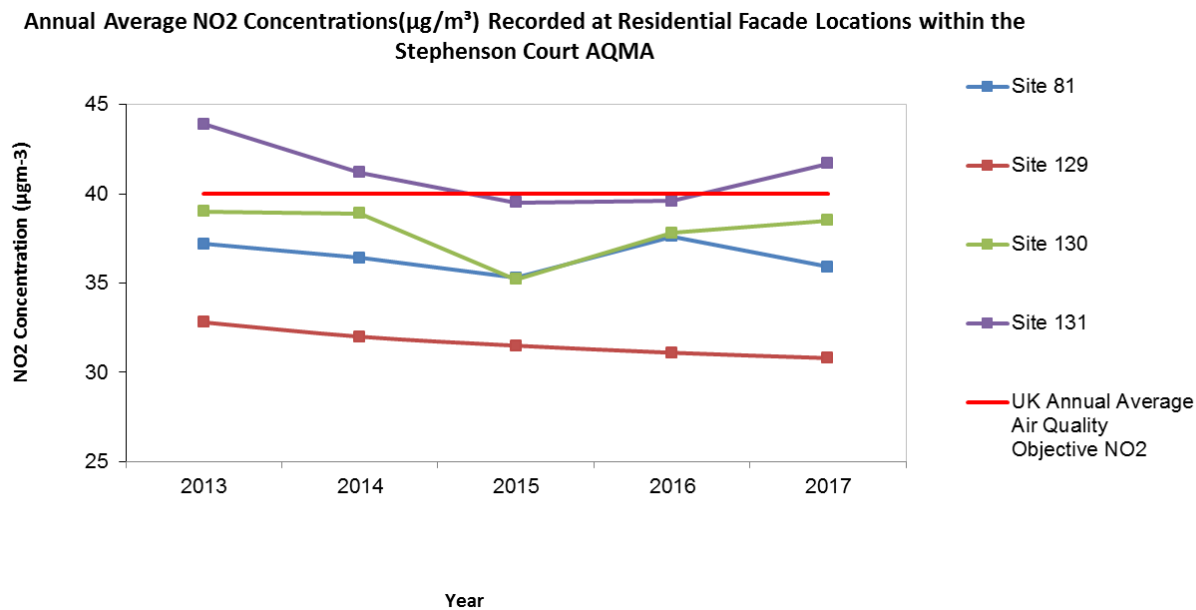
Residential monitoring locations with the Llandaff AQMA (Sites 99 and 161) showed compliance with the annual average objective, both results recorded at 31.0µg/m<sup>3</sup> & 33.4µg/m<sup>3</sup>. The 2017 APR

highlighted that any decision made to revoke the AQMA needs to be mindful of the potential development of the strategic LDP sites to the north of the AQMA, Plasdwr and BBC Studios. Whilst detailed air quality assessments undertaken as part of the planning process have modelled that there is unlikely to be a detrimental impact on air quality levels in the AQMA, this can only be fully verified through on going monitoring.

In an effort to reassure local residents and to be totally satisfied that levels will remain compliant with the NO<sub>2</sub> standard Shared Regulatory Services (SRS) have reviewed the non-automatic monitoring network of NO<sub>2</sub> diffusion tubes for 2018. As result **new and amended monitoring sites** have been allocated. Officers will further assess the potential to implement real-time capabilities in the Llandaff AQMA as part of our statutory duties under Part IV of the Environment Act 1995.

**Please note** In 2017 Site 33 was relocated to the residential façade of the occupied old police station, this being the position whereby previous years’ distance correction calculations was undertaken to. By relocating the monitoring station to the façade of the old police station, thus representing worse-case exposure as an increased level of certainty can be associated with the annual average result as no further correction via the use of the “fall-off” calculator is necessary. It could be argued that the site’s location change would require a new site ID, however in this instance it was felt necessary to keep the ID the same and clearly show the difference between NO<sub>2</sub> datasets at the kerbside and façade location.

**Figure 2.9- Trends in Annual Average NO<sub>2</sub> Concentrations Recorded at Residential Façade Locations within the Stephenson Court AQMA.**





Three of the four monitoring sites within the Stephenson Court AQMA (Sites, 81, 129 & 130) showed compliance with the annual average objective, however results remain elevated, particularly at Site 130 which is encroaching on the UK objective.

There are 10 façade-based diffusion tube sites with complete annual mean datasets from 2002, i.e. from when the Council started determining an annual bias-adjustment factor. These sites are numbers 16, 49, 81, 82, 85, 86, 96, 97, 99 and 100. Bias-adjusted nitrogen dioxide concentrations from these 10 sites have been averaged for each year and plotted in Figure 2.4 to give a combined, representative trend over the years since 2002.

The plot seems to indicate a very slow, gradual increase in nitrogen dioxide concentrations in earlier years, possibly influenced by the noticeable concentration peaks in 2003, 2007 and 2010. It is evident that average concentrations dropped significantly for years 2014 & 2015 and somewhat stabilised for the recent years after.

In accordance with LAQM best practise guidance; there are no monitoring sites in the district with annual average concentrations above  $60\mu\text{g}/\text{m}^3$  in 2017. Therefore this indicates it is unlikely that the hourly nitrogen dioxide objective was exceeded.

### 2.3.2 Particulate Matter (PM<sub>10</sub>)

As described in previous sections, monitoring of PM<sub>10</sub> has continued to be carried out at the Cardiff Centre AURN monitoring site and the summary data is given in Tables 2.6 and 2.7.

The results of the monitoring indicate that recorded PM<sub>10</sub> concentrations at the Cardiff City Centre AURN monitoring station are compliant with both the annual mean ( $40\mu\text{g}/\text{m}^3$ ) and 24-hour mean ( $>50\mu\text{g}/\text{m}^3$  not to be exceeded more than 18 times per year) AQS objectives set for PM<sub>10</sub>.

### 2.3.3 Sulphur Dioxide (SO<sub>2</sub>)

Sulphur dioxide was measured at the Cardiff Centre AURN automatic monitoring site during 2017. The site is classified as “Urban Background” and is a relevant location for the 15-minute and 1-hour Objectives. Data for the monitoring is given in Table 2.8.

There were no exceedences of the set objectives during 2017.

### **2.3.4 Benzene**

No monitoring of Benzene was undertaken by SRS on behalf of Cardiff Council in 2016.

### **2.3.5 Other Pollutants Measured**

During 2017 monitoring for ozone and carbon monoxide was carried out in Cardiff. Details are in the following sections

#### **Carbon Monoxide**

Carbon monoxide was monitored at Cardiff Centre AURN during 2017.

Data capture at for the whole year at the Cardiff Centre AURN site was 99.1% and there were no exceedences of the objective. Table 2.9 summarises the findings.

There continues to be no risk of the National Air Quality Standard being exceeded.

## Ozone (O<sub>3</sub>)

Cardiff Council monitors Ozone due to its potential correlations with other pollutants. In 2017, ozone was measured at the Cardiff City Centre, Frederick Street AURN site. Although Ozone is not included in the Local Air Quality Management system, the results are included in Table 2.10 for completeness.

The results are compared with the running 8-hour mean objective as set by the Expert Panel on Air Quality Standards (EPAQs) which states the running 8-hour mean should not exceed 100µg/m<sup>3</sup> on more than 10 days per year. There are three exceedences of the ozone objective in Cardiff in 2017.

## 2.4 Summary of Compliance with AQS Objectives as of 2017

Shared Regulatory Services have reviewed the results from the monitoring undertaken across the Cardiff in 2017.

The datasets indicate that the annual average objective for NO<sub>2</sub> was breached at monitoring locations outside of the existing AQMAs (Sites 172, 179, 180 & 181).

It is felt that at this stage no further detailed assessments are required;

Site 172 is placed on Ocean Way to monitor potential impacts of traffic resulting from industrial developments in the area. The site is not representative of relevant exposure, the nearest being >650m away. For 2018 Site 172 has been revoked from the monitoring network as it is felt that a strong trend of data has been collected at this location.

The 1-hour objective for NO<sub>2</sub> need only apply to site 179.

Sites 180 & 181 were implemented to monitor air quality levels and therefore the potential impacts to future occupants at new development sites. These developments were still under construction in 2017 and therefore datasets collected will be negatively influenced.



## **3. New Local Developments**

### **3.1 Road Traffic Sources (& other transport)**

SRS on behalf of Cardiff Council continue to work and engage with the Transport and Highways team in Cardiff Council, consulting upon any road network proposals that has the potential to influence local air quality levels.

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

Cardiff Council has considered road traffic sources extensively in both this and each year in earlier reports; the monitoring network is very largely focused on measuring concentrations of nitrogen dioxide close to many of them. These have been discussed either in previous reports or earlier in this report.

There are no newly identified road traffic sources which need to be considered.

For 2017 SRS on behalf of Cardiff Council confirms that there are no new/newly identified congested streets with a flow above 5,000 vehicles per day and residential properties close to the kerb, that have not been adequately considered in previous rounds of Review and Assessment.

#### **3.1.2 Busy Streets Where People May Spend 1-hour or More Close to Traffic**

Datasets collected from improved monitoring locations along Kingsway/ Duke Street/ Castle Street Link area have been compared to the 1-hour objective set for NO<sub>2</sub> due to the fact each site is known for commercial use at ground floor level. Levels are shown to be compliant with the objective.

There are no new locations identified since the Council's 2017 Progress Report was submitted and there is no need to consider this further at this time.

SRS on behalf of Cardiff Council confirms that there are no new/newly identified busy streets where people may spend 1 hour or more close to traffic.

### **3.1.3 Roads with a High Flow of Buses and/or HGVs.**

Other than Westgate Street, there are no roads in Cardiff where buses, coaches and HDVs account for >20% of road traffic, where flow of these vehicles is >2500 and there is relevant exposure within 10m of the kerb.

SRS on behalf of Cardiff Council confirms that there are no new/newly identified roads with high flows of buses/HDVs.

### **3.1.4 Junctions**

Junctions have been fully considered in previous annual reviews and assessments.

SRS on behalf of Cardiff Council can confirm that there are no new/newly identified busy junctions/busy roads where exceedences of either the nitrogen dioxide or PM<sub>10</sub> objectives are likely.

### **3.1.5 New Roads Constructed or Proposed Since the Last Round of Review and Assessment**

SRS on behalf of Cardiff Council can confirm that there are no new/proposed roads.

### **3.1.6 Roads with Significantly Changed Traffic Flows**

Ratified traffic data has been examined and there are no roads in Cardiff which have experienced traffic flow (AADT) growth of 25% or more in the preceding three years.

There is increasing evidence from the traffic measurements both locally and regionally to suggest that, for economic and other reasons, traffic growth on major routes has stopped year-on-year and may even have declined recently. This has, for example, resulted in a number of air quality assessments submitted with planning applications assuming current levels of road traffic as a worst-case scenario.

It should be noted that Cardiff Council is actively implementing its traffic management policy of a 50:50 modal split, i.e. 50% of journeys being made other than by the private car. This is not just for new developments but also for the local road network as a whole.

The Council is currently considering planning applications for significant housing and mixed used developments at a number of “strategic sites” across the city.

SRS on behalf of Cardiff Council can confirm that there are no new/newly identified roads with significantly changed traffic flows.

### **3.1.7 Bus and Coach Stations**

The 2017 APR outlined planning application (16/02731/MJR). The planning application was subject to approval following the fulfillment of a number planning conditions that accompanied the application in regards to air quality. However, at the time of writing this report the application has been amended and therefore has been resubmitted as a new application (18/01705/MJR). Air Quality Assessments have been submitted and an initial response from Cardiff Council has been made.

In November 2016 consent was granted for a Cardiff West Bus Interchange.

SRS on behalf of Cardiff Council can confirm that there are no relevant bus stations in the Local Authority area.

### **3.1.8 Airports**

There are no airports in Cardiff. The nearest airport is Cardiff International which is located approximately 15 miles to the west of Cardiff in The Vale of Glamorgan Council’s area.

There are no airports planned or proposed within the Council’s area and nowhere to put one.

SRS on behalf of Cardiff Council confirms that there are no airports in the Local Authority area.

### **3.1.9 Railways (Diesel and Steam Trains)**

Cardiff is well-served by passenger rail transport. The main Swansea to London Paddington line is served by Cardiff Central Station. Additionally, there is a network of local-line services running, in the main, to the valleys north of Cardiff.

LAQM.TG(16) suggests that SO<sub>2</sub> emissions from diesel locomotives may be significant if there are outdoor locations where locomotives are regularly stationary for more than 15minutes and where

members of the public could be regularly exposed over this period at such locations.

LAQM.TG(16) also requires consideration exposure to nitrogen dioxide within 30m of certain specified railway lines in those areas where the annual mean background concentration is above  $25\mu\text{gm}^{-3}$ .

### Stationary Trains

Stationary trains have been considered fully in earlier reports with regard to potential exceedences of the sulphur dioxide objective. No potential exceedences were found and nothing has changed in this regard since then. There is no need to further assess this source.

It should be recorded that works are now underway in preparation for the electrification of the main Swansea/Cardiff to London Paddington line. The effects of this on local emissions can be only beneficial.

Discussions with regard to the electrification of the local line network are ongoing.

SRS on behalf of Cardiff Council confirms that there are no locations where diesel or steam trains are regularly stationary for periods of 15 minutes or more, with potential for relevant exposure within 15m.

### Moving Trains

LAQM.TG(09) introduced a new requirement to assess the potential for exceedence of nitrogen dioxide objectives. The assessment criteria are in relation to large numbers of diesel locomotive movements where there is relevant exposure within 30metres of the track in areas where the background annual mean concentration of nitrogen dioxide is above  $25\mu\text{m}^{-3}$ .

This assessment was carried out for the 2009 USA and nothing has changed in the intervening period. There is no need to further assess this source.

It should be recorded that works are now underway in preparation for the electrification of the main Swansea/Cardiff to London Paddington line. The effects of this on local emissions can be only beneficial.



Discussions with regard to the electrification of the local line network are ongoing.

SRS on behalf of Cardiff Council confirms that there are no locations with a large number of movements of diesel locomotives, and potential long-term relevant exposure within 30m.

### **3.1.10 Ports (Shipping)**

The 2012 USA reported:

“Cardiff docks are not a ferry terminal, there is no Ro-Ro usage and no cruise liners use the port. There is some container traffic using the port and the docks handle bulk cargoes such as sand and grain. Coal-handling operations ceased some years ago.”

In accordance with LAQM.TG(16) guidance threshold of 5000 movements per annum, with relevant exposure within 250m of the berths and main areas or 15,000 large ship movements per annum, with relevant exposure within 1km of these areas is not close to being approached and the risk of exceedance of the SO<sub>2</sub> objectives is considered very small.

Nothing has changed in this regard since the last 2015 USA report at that time and there is no need to consider this source further.

SRS on behalf of Cardiff Council confirms that there are no ports or shipping that meet the specified criteria within the Local Authority area

## **3.2 Industrial / Fugitive or Uncontrolled Sources / Commercial Sources**

### **3.2.1 New or Proposed Installations for which an Air Quality Assessment has been Carried Out**

In September 2017, Cardiff Council received a planning proposal (referenced application (17/02130/MJR)) for the construction and operation of a 9.5MW biomass power plant, situated on land at Rover Way, Pengam, Cardiff. Air quality assessments and supporting technical notes have been compiled by certified appointed consultants in support of the application, to which it is concluded that potential impacts associated with the scheme are not significant. It is understood that the planning application for the biomass power plant is only at outline stage and as such detailed design and specification for the plant is yet to be undertaken. The planning application has been granted consent in June 2018 subject to approval for a number of applied conditions, including air quality specific conditions;

#### **Condition**

#### **AIR QUALITY ASSESSMENT**

Prior to the approval of any reserved matters application for the Biomass Power Plant an Air Quality Assessment (AQA) for the detailed design of the Biomass Plant shall be submitted to and approved in writing by the Local Planning Authority. The AQA shall include an assessment of the impact of the plant emissions and any necessary mitigation measures to ensure the overall impacts of the plant are acceptable. The plant shall be constructed in accordance with the approved details and maintained thereafter.

Reason: To ensure air quality is maintained to satisfactory levels and to avoid any adverse effect upon the integrity of the Severn Estuary European Sites and the Severn Estuary SSSI.

In terms of neighbouring authorities and any major proposed industrial installations, as previously declared in the 2017 APR; on the 31<sup>st</sup> July 2015 the Vale Council approved planning permission for the construction and operation of a biomass gasification facility at Woodham Road, Barry, CF63 4JE (Grid Reference ST 12610 67683). It was noted in the 2017 APR that Natural Resources Wales (NRW) were going through a second round of consultation in regards to a permit application for the proposed operation, submitted by Biomass UK NO.2 Ltd. This second round of consultation was formed as a result of a Section 5 amendment direction sanctioned by NRW; "NRW Schedule 5 notice re Biomass requesting more information" dated 4 May 2017. As part of the amendment a revised air

quality assessment (AQA) was submitted in July 2017. Following much dialogue involving comments passed by SRS on behalf of VoGC, NRW granted approval for the sites permit application in February 2018.

SRS on behalf of Cardiff Council has assessed new/proposed industrial installations, and concluded that no further air quality analysis via a detailed air quality assessment is necessary.

### **3.2.2 Existing Installations where Emissions have Increased Substantially or New Relevant Exposure has been introduced**

In the 2017 APR it was outlined that a decision was sought after in regards to the modification of a S106 agreement that accompanies the Viridor Waste Management Facility in Trident Industrial Park, Splott. In July 2017 it was agreed that the S106 be modified and therefore the removal of the obligation that waste may only be acquired from the South East Wales Region.

SRS on behalf of Cardiff Council can confirm there are no industrial installations with substantially increased emissions or new relevant exposure in their vicinity within its area or nearby in a neighbouring authority.

### **3.2.3 New or Significantly Changed Installations with No Previous Air Quality Assessment**

There are no new or significantly changed industrial installations for which previous air quality assessments have not been carried out and which could give rise to potentially significant emissions of regulated pollutants either within Cardiff or within neighbouring local authorities.

SRS on behalf of Cardiff Council can confirm that there are new or proposed industrial installations for which planning approval has been granted within its area or nearby in a neighbouring authority.

### **3.2.4 Major Fuel (Petrol) Storage Depots**

As reported in the 2012 USA, there is one major fuel (petrol) storage depot in Cardiff. This is the Chevron Terminal located in Cardiff Docks which was assessed in previous reports. This installation is subject to an EPR Permit and regulated by the Council. Capacity and throughput at this site has not altered significantly for the worse since the last assessment and no new relevant exposure exists.

SRS on behalf of Cardiff Council can confirm that there are major fuel (petrol) storage depots within the Local Authority area, but these have been considered in previous reports.

### **3.2.5 Petrol Stations**

There are no new petrol stations in Cardiff with throughputs greater than 2000m<sup>3</sup> per annum with a busy road nearby where there is relevant exposure within 10m of the pumps.

It is not necessary, therefore, to consider this further.

SRS on behalf of Cardiff Council can confirm that there are no petrol stations meeting the specified criteria.

### **3.2.6 Poultry Farms**

The criteria for assessing poultry farms are set out in Table 7.3, point 4 of TG(16) (Defra, 2016). No farms exceeding the relevant criteria (turkey units with greater than 100,000 birds, naturally ventilated units with greater than 200,000 birds or mechanically ventilated units with greater than 400,000) have been identified.

SRS on behalf of Cardiff Council can confirm that there are no poultry farms meeting the specified criteria.

## **3.3 Commercial and Domestic Sources**

### **3.3.1 Biomass Combustion – Individual Installations**

As highlighted in Section 3.2.1 planning consent, subject to the approval of conditions attached has been granted for a 9.5MW biomass power plant on land at Rover Way, Pengam, Cardiff. Updates of the development will be included in the 2019 APR for Cardiff.

### **3.3.2 Biomass Combustion – Combined Impacts**

Previous reports have confirmed that there are no known areas in Cardiff where coal or solid fuel burning provides a significant level or primary household heating. Nothing has changed in this regard since the 2017 APR, despite the potential for increasing popularity of solid fuel heating with increased fossil-fuel prices, and there is no need to consider this further at this time.



SRS on behalf of Cardiff Council can confirm that there are no biomass combustion plants in the Local Authority area.

### **3.3.3 Other Sources**

### **3.3.4 Domestic Solid-Fuel Burning**

Previous reports have confirmed that there are no known areas in Cardiff where coal or solid fuel burning provides a significant level or primary household heating. Nothing has changed in this regard since the 2017 APR, despite the potential for increasing popularity of solid fuel heating with increased fossil-fuel prices, and there is no need to consider this further at this time.

It should be noted that the Council receives a number of enquiries each year from residents in respect of national or local requirements were they to wish to install log-burners or similar appliances in their homes. There are no smoke control area in Cardiff and hence no legal requirements with regard to appliances that may be installed. However, residents are always reminded of the legislation in respect of statutory smoke nuisance and, where they can't be persuaded otherwise for reasons of air quality and health, recommended to seek out an appliance certified for use in a smoke control area.

SRS on behalf of Cardiff Council can confirm that there are no areas of significant domestic fuel use in the Local Authority area.

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

There are no new locations where fugitive could occur which have not been covered by previous rounds of review and assessment and no locations where new relevant exposure has been introduced to existing locations.

It is not considered necessary to consider this further at this time.

SRS on behalf of Cardiff Council can confirm that there are no potential sources of fugitive particulate matter emissions in the Local Authority area.

## 3.5 Planning Applications

The Council continues to monitor the impact of proposed developments and recent developments already underway or in use.

The following developments may either be of significance in respect of local air quality or be a proposed development where air quality is a consideration.

### 3.5.1 LDP Strategic Sites North West

Since the LDP was adopted, numerous outline planning permissions have been granted in respect of Strategic Sites C and D in the North West of Cardiff. The outline applications submitted in respect of Strategic Site C comprise:

#### **14/02188/MJR – Land South of Pentrebane Rd – approved 13/12/16**

*Up to 290 residential dwellings (C3), open space (including childrens play space), landscaping, sustainable urban drainage, vehicular access, pedestrian and cycle accesses and related infrastructure and engineering works.*

#### **14/02157/MJR – Land North and South of Llantrisant Rd – outline application approved 09/08/2016**

*The development of up to 630 residential dwellings (use class c3, including affordable homes), primary school (use class d1), visitor centre/community centre (use class d1), community centre (use class d1), open space (including children's play spaces), landscaping, sustainable urban drainage, vehicular accesses, bus lanes, pedestrian and cycle accesses and related infrastructure and engineering works.*

#### **14/02733/MJR – North West Cardiff – approved 20/03/2017**

*Outline planning application with all matters reserved apart from strategic access junctions for residential-led mixed use development, to be developed in phases, including preparatory works as necessary including demolition and re-grading of site levels; up to 5,970 residential units (use class c3, including affordable homes); 3 no. Local centres providing residential units, convenience shops and facilities/services (including up to 7,900 sq m in use classes a1-*

*a3) and 1no. District centre providing residential units, up to 12,000 sq m in use classes a1-a3 including up to two food stores (up to 5,000 sq m gross) with associated parking, up to 15,500 sq m of use class b1(a), b1(b) and b1(c); provision of up to 5,100 sq m of community and healthcare facilities across the district and local centres (use classes d1 and d2); provision for 3no. Primary schools and 1no. Secondary school; open space including allotments; parks; natural and semi natural green space; amenity green spaces; facilities for children and young people; outdoor sports provision including playing pitches; associated infrastructure and engineering works including new vehicular accesses, improvement works to the existing highway network, new roads, footpaths/cycleways, a reserved strategic transport corridor; up to 1 no. Electricity primary-substation and landscaping works (including suds).*

**16/00106/MJR – Goitre Fach Farm, Llantrisant Rd – approved 27/04/17**

*Outline planning application (all matters reserved apart from strategic vehicular, cycle and pedestrian access into the site) for the demolition of existing buildings and residential development of up to 300 dwellings on site to include open space (including children's play space), landscaping. Sustainable urban drainage, vehicular access, pedestrian and cycle accesses and related infrastructure and engineering works.*

A single outline application has been submitted in respect of Strategic Site D, below, and none to date in respect of Strategic Site E.

**14/00853/DCO – Land to the North of M4 Junction 33 – approved 07/09/2017**

*Comprehensive development of 'Land to the North of Junction 33 of the m4' to create a new community containing: A range of new homes, including houses, apartments and some sheltered accommodation for the elderly (Use Classes C2 and C3), a park and ride facility and transport interchange or hub, community facilities including a new primary school and community centre (Use Class D1), a local centre including shops (Use Class A1), financial and professional (Use Class A2), food and drink (Use Class A3) and a clinic or surgery (Use Class D1), new offices, workshops and research and development facilities (Use Classes B1 with ancillary B2 and B8), a network of open spaces including parkland, footpaths, sports pitches and areas for informal recreation, new roads, parking areas, accesses and paths, other ancillary uses and activities, and requiring; site preparation, the installation or improvement of services and infrastructure; the creation of drainage channels;*

*improvements/ works to the highway network and other ancillary works and activities.*

The impact of the above proposals on the environment has been fully considered in the determination of each of the above applications and subsequent related applications. The LDP has two key policies to ensure that the impacts on air quality from developments do not impede on public health or the environment, and these are;

**KP18 deals with Natural Resources:**

*“In the interests of the long-term sustainable development of Cardiff, development proposals must take full account of the need to minimise impacts on the city’s natural resources and minimise pollution, in particular the following elements:...(iii). Minimising air pollution from industrial, domestic and road transportation sources and managing air quality;”*

**EN13, which addresses air, noise, light pollution and contaminated land:**

*“Development will not be permitted where it would cause or result in unacceptable harm to health, local amenity, the character and quality of the countryside, or interests of nature conservation, landscape or built heritage importance because of air, noise, light pollution or the presence of unacceptable levels of land contamination.”*

To comply with the referenced policies, appropriate air quality assessments have been undertaken and submitted as part of the planning applications for the proposed developments. The submitted air quality assessments have been undertaken in line with best practise guidance and consider future air quality levels for the established Llandaff AQMA.

The air quality assessments have captured various scenarios using air quality dispersion modelling software. The impacts of the proposed development and other strategic developments in Cardiff’s Local Plan has been assessed alone and in combination in a series of sensitivity tests utilising dispersion modelling software. The assessments indicate that the impact to the Llandaff AQMA will be insignificant when considering both the individual LDP developments and the cumulative impact of the developments.

An Environmental Statement was submitted as part of each outline application mentioned above and provided a comprehensive assessment of the potential impacts of the proposed development, which covered the following topics: Socio Economic, Transportation, Water Resources, Ecology, Landscape & Visual, Noise & Vibration, Air Quality, Heritage, Agriculture and Soils, and Cumulative & Residual effects. Each ES considered both the traffic and air quality impact of the developments, including the impact on the Llandaff Air Quality Management Area during both the construction and operational phases, which was carefully considered in the assessment of the applications.

The Planning Committee report for each outline application summarises the development proposals, the responses of consultee and third party responses, provides an analysis of the impact of the developments – including traffic and air quality impacts, and sets out the planning obligations and conditions considered necessary to manage their impacts and allow the proposals to come forward for development. Furthermore, the applications were approved subject to extensive mitigation in the form of detailed highway improvement works, a suite of transport conditions (encompassing detailed highway improvement works, car and cycle parking, street cross sections, travel plans, traffic monitoring, phasing, construction environmental management plans) and a package of s106 contributions for off-site highway improvement measures. The improvement measures will be phased to support the implementation of the strategic sites and help achieve the LDP city-wide 50:50 modal split target.

Together, the developments will deliver new and improved pedestrian and cyclist routes and facilities, bus priority measures, improved bus services and new routes and stops. Future public transport routes will also be protected. Traffic signal, junction and traffic management improvements will help to manage the flow of traffic on the network and hold queues in appropriate locations outside of AQMAs. A Park & Ride facility was also secured as part of Strategic Site D. The developments include travel plan measures and financial contributions towards air quality monitoring. The Planning Committee report for each application confirmed that the Environmental Statements were taken into consideration in the assessment of the application, that the conclusions were considered sound, and that there were no demonstrable or compelling reasons which indicate sufficient harm to warrant refusal of the application, with all material factors, policy implications and issues raised through consultation satisfactorily addressed.

### **3.5.2 Central Business District**

The 2017 APR outlined planning application (16/02731/MJR). The application was subject to approval with needed compliance in accordance with specific conditions that addressed air quality. At the



time of writing this report the application has been amended and therefore been resubmitted as a new application (18/01705/MJR). An update on the decision of this application will be provided in the 2019 APR.

### 3.5.3 City Road- Student Accommodation

During the course of 2017 and 2018 there have been many pre planning applications and full planning applications received by Cardiff's planning department. The applications are concentrated along City Road, Cardiff and outline plans for the development of multi- storey student accommodation facilities. The proposals are "car-free" and therefore do not increase pressures onto the local road network, however the locality of the developments is a concern given the increased levels of NO<sub>2</sub> monitored along City Road. The applications have been treated holistically in terms of air quality. The applicants have been requested to consider both construction and operational phases of the developments. Based on received comments and observing design and access statements which support the applications, it is noted that the developments do not accommodate residential units at ground level and therefore it is felt that only the short term (1-hour) air quality objective for NO<sub>2</sub> only need to be considered.

### 3.5.4 Velindre Cancer Centre (17/01735/MJR)

**PROPOSED VELINDRE CANCER CENTRE INCLUDING SPECIALIST CANCER TREATMENT CENTRE, CENTRE FOR LEARNING, RESEARCH AND DEVELOPMENT, PRIMARY MEANS OF ACCESS (FROM CORYTON INTERCHANGE), EMERGENCY ACCESS (VIA HOLLYBUSH ESTATE), TEMPORARY CONSTRUCTION ACCESSES, PARKING, ENERGY CENTRE, LANDSCAPE WORKS, PEDESTRIAN PATHS, AND MAGGIE'S CENTRE. | Land to the north-west of Whitchurch Hospital Playing Fields**

The proposal was supported by an Environment Impact Assessment that included air quality detailed modelling. The Air Quality Assessment (AQA) considered the construction phase and operational phase impacts associated with the proposed development.

The main outcomes to be drawn from the report are;

1. ***The results from the construction dust assessments show that the construction activities associated with the proposed development would result in a 'Medium' to 'High' risk for dust soiling, a 'Low' to 'Medium' risk for PM10 health effects and a 'Low' to 'Medium' risk for ecological effects (without mitigation).***
2. ***The results from the operation phase assessment show that the energy centre and changes in traffic associated with the proposed development are expected to have a negligible impact on new and existing receptors. The predicted concentrations at the proposed development are well below the air quality objectives and therefore the site is considered suitable for the introduction of new receptors.***

On the grounds of air quality there were no crucial concerns with regards to the proposal. In 2018 the proposal was granted permission by Cardiff Council, subject to compliance with the conditions specified.

### **3.5.5 Rover Way Biomass Power Plant (17/02130/MJR)**

**17/02130/MJR | THE REMOVAL OF FILL MATERIAL AND THE CONSTRUCTION OF A BIOMASS POWER PLANT (UP TO 9.5MW) AND A MAXIMUM OF 130,000 SQ. FT. OF INDUSTRIAL ACCOMMODATION (B8 USE CLASS), NEW ACCESS ROADS AND ASSOCIATED LANDSCAPING WORKS | LAND AT ROVER WAY, PENGAM**

Please see **Section 3.2.1** for more information.

### **3.5.6 Hallinans House Student Accommodation (17/01063/MJR)**

As detailed by the design brief;

The proposed development will require the demolition of Hallinan's House and the construction of a new tall building (over 30 storeys), that will provide accommodation for up to 500 students. It lies close to an Air Quality Management Area (AQMA) declared by Cardiff City Council for exceedances of the annual mean nitrogen dioxide objective. The development will not significantly increase traffic on local roads. The new student accommodation will, however, be subject to the impacts of road traffic emissions from the adjacent road network.

As instructed by Council officers an AQA was submitted in accordance with the referenced planning application. The report quantified the air quality impacts associated with the construction and operation phases of the proposed student accommodation.

Air quality conditions for new residents within the proposed development have also been considered. Nitrogen dioxide concentrations are predicted to be above the air quality objectives at the northwest corner of the building, up to the fifth floor level. Mitigation is therefore required to ensure that air quality is acceptable throughout the building, and that the site is therefore suitable for the proposed use.

The main outcomes to be drawn from the report are;

- The construction works will give rise to a *Medium* Risk of dust impacts. It will therefore be necessary to apply a package of mitigation measures to minimise dust emissions. With these mitigation measures in place, the overall impacts during construction will be 'not significant'.
- Emissions from the proposed CHP and boilers within the proposed development will lead to an increase in nitrogen dioxide concentrations at nearby existing properties. The assessment has demonstrated that increases in both 1-hour mean and annual mean concentrations of nitrogen dioxide at existing properties will be *negligible*, and impacts will therefore be 'not significant'.
- Air quality conditions for new residents within the proposed development have also been considered. Nitrogen dioxide concentrations are predicted to be above the air quality objectives at the northwest corner of the building, up to the fifth floor level. Mitigation is therefore required to ensure that air quality is acceptable throughout the building, and that the site is therefore suitable for the proposed use.

Due to the modelled elevated and exceeding levels of NO<sub>2</sub> predicted at the northwest corner of the building additional air quality modelling has been requested in the form of a condition which must be complied to prior to any works other than demolition and remediation works.

**Condition- Additional Air Quality Dispersion Modelling**

No development other than demolition and remediation works shall take place until an air quality assessment examining the projected air quality levels for NO<sub>2</sub> at the commercial and residential levels of the proposed development has been submitted to and approved in writing by the Local Planning Authority. The report shall consider the cumulative impact derived from nearby traffic and the on-site energy plant, accurately determining those areas and rooms where exceeding and elevated levels of NO<sub>2</sub> is predicted. Where annual average levels  $\geq 36\mu\text{g}/\text{m}^3$  at residential rooms and  $\geq 50\mu\text{g}/\text{m}^3$  at commercial areas are projected, mitigation measures shall be submitted to and approved in writing by the Local Planning Authority. The mitigation measures shall be implemented to the satisfaction of the Local Planning Authority prior to beneficial occupation and retained thereafter.

Reason: To safeguard the health of future occupiers of the proposed development.

### 3.5.7 Newport Road Residential Accommodation (15/03159/MJR)

In 2016 planning consent was permitted for the development of residential accommodation located on Newport Road, Cardiff. The permission was granted subject to compliance was met with conditions accompanying the permission.

#### **Condition 12 (Air Quality), Planning Reference (17/02278/MJR)**

Due to the locality of the proposed development which was directly adjacent to the boundary of the Stephenson Court AQMA the condition was implemented. An AQA was submitted in accordance with the condition. The report considered the potential impacts to future residents of the development due to the close proximity to the established Stephenson Court AQMA and nature of the location; adjacent to the busy road network A4161 Newport Road.

The report stipulated; ***Predicted concentrations across the site are below 80% of all relevant standards for all pollutants. On the basis of these results, no mitigation measures are required.***

Following the review of the AQA the condition was approved and signed off. Construction is well underway at the proposed site.

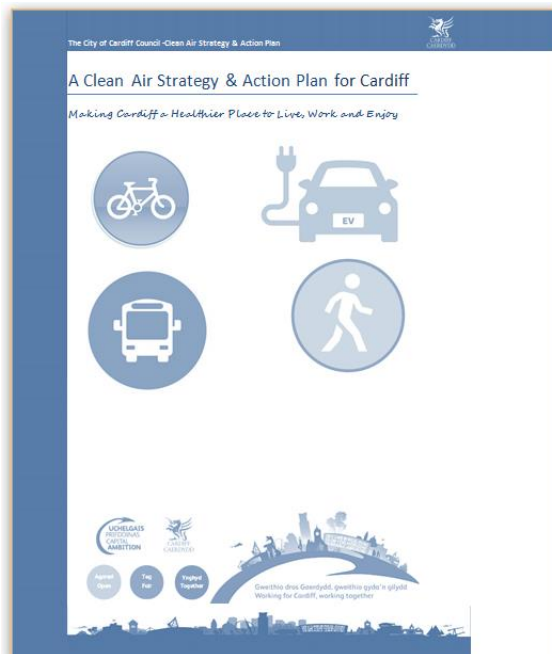
## 4. Policies and Strategies Affecting Airborne Pollution

### 4.1 Local / Regional Air Quality Strategy

#### Cardiff's Clean Air Strategy and Action Plan

As outlined in the 2017 APR SRS on behalf of Cardiff Council are coordinating the development of a Clean Air Strategy (CAS) & Action Plan. The document outlines a citywide approach to mitigate poor air quality in Cardiff and recognises that interventions to address poor air quality cannot be utilised in silo and implemented locally. Therefore citywide measures need to be put into practice to hopefully provide citywide improvements to air quality.

As mentioned previously in this document the CAS & Action plan accompanies this 2018 APR as a separate document and fulfils the requirements of the LAQM process to produce an Air Quality Action Plan (AQAP). The document also captures the Direction given to CC in March 2018 by WG for Cardiff to address its air quality concerns along highlighted major road networks.



### 4.2 Air Quality Planning Policies

Cardiff's Local Development Plan (LDP) 2006-2026, forms the basis for decisions on land use planning in Cardiff up to 2026 and assumes that, within the plan's time frame, approximately 40,000 new jobs and 41,100 new dwellings will be developed in Cardiff as a direct response to Cardiff's role as the economic driver of the City-region.

In addition to its independent examination, the LDP was subject to a Strategic Environmental Assessment (SEA) to ensure that the policies reflect sustainability principles and take into account environmental impacts.

Policy KP2 of the LDP allocates 8 Strategic Sites to help meet the need for new dwellings and jobs. These strategic allocations on both greenfield and brownfield sites will include 500 homes or more



and/or include significant employment/mixed uses which will bring significant benefits to the city.

The sites are:

- (i) Cardiff Central Enterprise Zone;
- (ii) Former Gas Works, Ferry Road;
- (iii) North West Cardiff;
- (iv) North of Junction 33 on the M4;
- (v) South of Creigiau;
- (vi) North East Cardiff (West of Pontprennau);
- (vii) East of Pontprennau Link Road; and
- (viii) South of St. Mellons Business Park – Employment Only.

The LDP identifies that sustainable transportation solutions are required in order to respond to the challenges associated with new development by setting out an approach aimed at minimising car travel, maximising access by sustainable transportation and improving connectivity between Cardiff and the wider region.

The Plan sets out a strategy to achieve this by making the best use of the current network, managing demand and reducing it where possible by widening travel choices. The aim is to secure a modal split of 50% car and 50% non-car modes.

The following LDP policies are of relevance to air quality;

#### **KP14: HEALTHY LIVING**

*Cardiff will be made a healthier place to live by seeking to reduce health inequalities through encouraging healthy lifestyles, addressing the social determinants of health and providing accessible health care facilities. This will be achieved by supporting developments which provide for active travel, accessible and useable green spaces, including allotments.*

#### **KP18: NATURAL RESOURCES:**

*In the interests of the long-term sustainable development of Cardiff, development proposals must take full account of the need to minimise impacts on the city's natural resources and minimise pollution, in particular the following elements.....minimising air pollution from industrial, domestic and road transportation sources and managing air quality.*

## **EN13: AIR, NOISE, LIGHT POLLUTION AND LAND CONTAMINATION**

*Development will not be permitted where it would cause or result in unacceptable harm to health, local amenity, the character and quality of the countryside, or interests of nature conservation, landscape or built heritage importance because of air, noise, light pollution or the presence of unacceptable levels of land contamination.*

## **C6: HEALTH**

*Priority in new developments will be given to reducing health inequalities and encouraging healthy lifestyles through:*

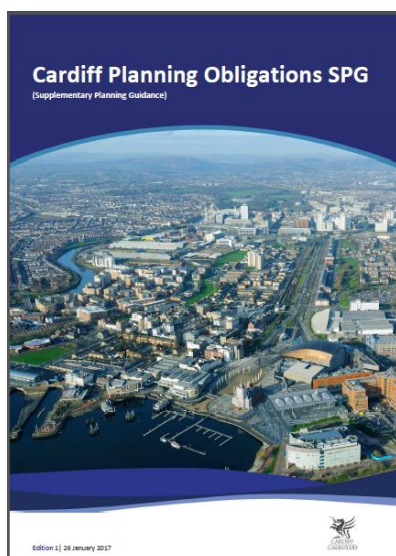
- i. Identifying sites for new health facilities, reflecting the spatial distribution of need, ensuring they are accessible and have the potential to be shared by different service providers; and*
- ii. Ensuring that they provide a physical and built environment that supports interconnectivity, active travel choices, promotes healthy lifestyles and enhances road safety.*

The LDP also outlines the approach the Council will take to increase the proportion of people travelling by sustainable modes and to achieve the 50:50 modal split target. This will involve:

- enabling people to access employment, essential services and community facilities by walking and cycling through, for example, high quality, sustainable design and measures to minimise vehicle speed and give priority to pedestrians and cyclists;
- developing strategic bus and rapid transit corridor enhancements and facilitating their integration with the wider transport network;
- facilitating the transfer between transport modes by, for example, improving existing interchanges and developing new facilities such as strategically located park and ride facilities; and
- maximising provision for sustainable travel within new developments and securing infrastructure investment which can support modal shift within existing settlements.

In addition to the measures identified directly in the LDP the Council has recently prepared Supplementary Planning Guidance (SPG) which supports and provides additional guidance on the policy aims of the LDP which will have benefits on Air Quality in Cardiff.

## Planning Obligations (January 2017)



This document sets out the Council's approach to planning obligations when considering applications for development. It provides further guidance on how the policies set out in the LDP are to be implemented and will assist in securing the provision of sustainable development across the city.

Poor air quality can impact on people's health / quality of life and local authorities are required to assess air quality in their areas against National Air Quality Standards. Where the need arises as a result of a proposed development, the document confirms that developers will be requested to provide an Air Quality Assessment

and, in the event of an adverse assessment, a proposed scheme of mitigation measures. In addition to a scheme of mitigation measures, a financial contribution may be sought towards the site specific monitoring of air quality emissions.

In respect of Transportation and Highways, the SPG confirms the Council will maximise opportunities for trips generated by new development to be made by walking, cycling and public transport and seek to ensure that the highway network is able to accommodate road traffic movements associated with new development in a safe and efficient manner. The following guidance is covered:

- developments requiring the provision of a Transport Statement or Transport Assessment;
- the provision of on-site infrastructure necessary to serve the development;
- the provision of or contribution towards offsite highway works, public transport infrastructure/ facilities provision and local interventions where the need arise;
- integrating public transport; and
- travel plans detailing a long term management and monitoring strategy for the delivery of sustainable transport objectives through positive action.

Planning obligations SPG is available at;

[https://www.cardiff.gov.uk/ENG/resident/Planning/Planning-Policy/Supplementary-Planning-Guidance/Documents/Cardiff%20Planning%20Obligations%20SPG%20-%20Edition%201%20\(26th%20January%202017\).pdf](https://www.cardiff.gov.uk/ENG/resident/Planning/Planning-Policy/Supplementary-Planning-Guidance/Documents/Cardiff%20Planning%20Obligations%20SPG%20-%20Edition%201%20(26th%20January%202017).pdf)

## 4.3 Local Transport Plans and Strategies

Cardiff is growing and changing, and this brings more journeys and more pressures on Cardiff's transport network. Reducing the number of car journeys made in the city, and promoting the use of active and sustainable modes of travel, are central to Cardiff Council's Transport Strategy and in improving air quality in the city. The LDP sets the target of achieving a 50:50 modal split – this means that 50% of all journeys need to be made by sustainable transport by 2026 in order to accommodate the future development set out in the LDP. Our policies set out in the LDP support the need to secure significant improvements to the public transport and active travel networks in combination with new developments.

Cardiff's Local Transport Plan (LTP) was approved by the Welsh Government in May 2015. The LTP sets out our main transport infrastructure proposals which will support this significant modal shift. The Local Transport Plan recognises the need to improve air quality. Its programme prioritises:

- development of active travel networks to increase walking and cycling for local journeys
- the provision of cycling infrastructure
- the bus network
- reduced speed limits
- reducing congestion
- improving transport efficiency and reliability
- bus based park and ride.

The Council has published an Annual Progress Report for Transport each year since 2002. These are available here:

<http://www.keepingcardiffmoving.co.uk/your-sustainable-travel-city>

### Challenges

Cardiff Council is committed to achieving a 50:50 modal split by 2026, as set out in Cardiff's Local Development Plan (LDP) 2006- 2026. However, there are a number of challenges that Cardiff faces in order to meet the 50:50 modal split;

- **Future Growth** - Cardiff's LDP provides for 41,000 new homes and 40,000 new jobs in Cardiff by 2026. It is envisaged that this level of growth will generate a (net) road traffic increase by

32% and so existing pressures on Cardiff's transport network will be intensified. A significant shift is required from car use to sustainable travel;

- **Inbound Commuting Traffic** - 38% of Cardiff's workforce travel to Cardiff from outside the county area. This commuting workforce from outside the county area has seen a 10% increase 2004 - 2014. Figures from the Census conducted in 2011 suggest that between 76% - 84% of the commuting workforce travel by car;
- **Health** - There is an urgent need to encourage healthy and active lifestyles in Cardiff; only 25% of Cardiff residents meet physical activity guidelines and 53% are obese or overweight (Welsh Health Survey 2010 and 2011). Social isolation and loneliness is another major need in our local population;
- **Sustainable and Active Travel Availability** - Areas poorly served by sustainable transport modes often have high levels of car ownership and become heavily reliant on the car for daily travel. The quality of the public transport network is major challenge for Cardiff; Ask Cardiff Surveys outlined a 4% decrease in daily bus use between 2007 and 2014. Across the UK over the last 5 years the cost of running a car has decreased by 5% while the cost of the bus has increased by 14% (Department for Transport). There is also a need for cycling and walking improvements in Cardiff. Levels of cycling are continuing to increase but 82% of Cardiff residents think cycling safety needs to be improved (Bike Life 2015).

## 4.4 Active Travel Plans and Strategies

In September 2014, the Welsh Government introduced the Active Travel (Wales) Act. This measure legally requires Welsh local authorities to map and plan suitable routes for Active Travel within certain areas, as designated by the Welsh Government.

The Cardiff Cycling Strategy sets out an ambitious vision to double the number of cycling trips by 2026, from a 9.2% modal share in 2015 to 18.4% in 2026. In order to achieve this vision, it will be necessary to develop a comprehensive network of cycling infrastructure which is suitable for use by people of all ages and abilities, and to work with key





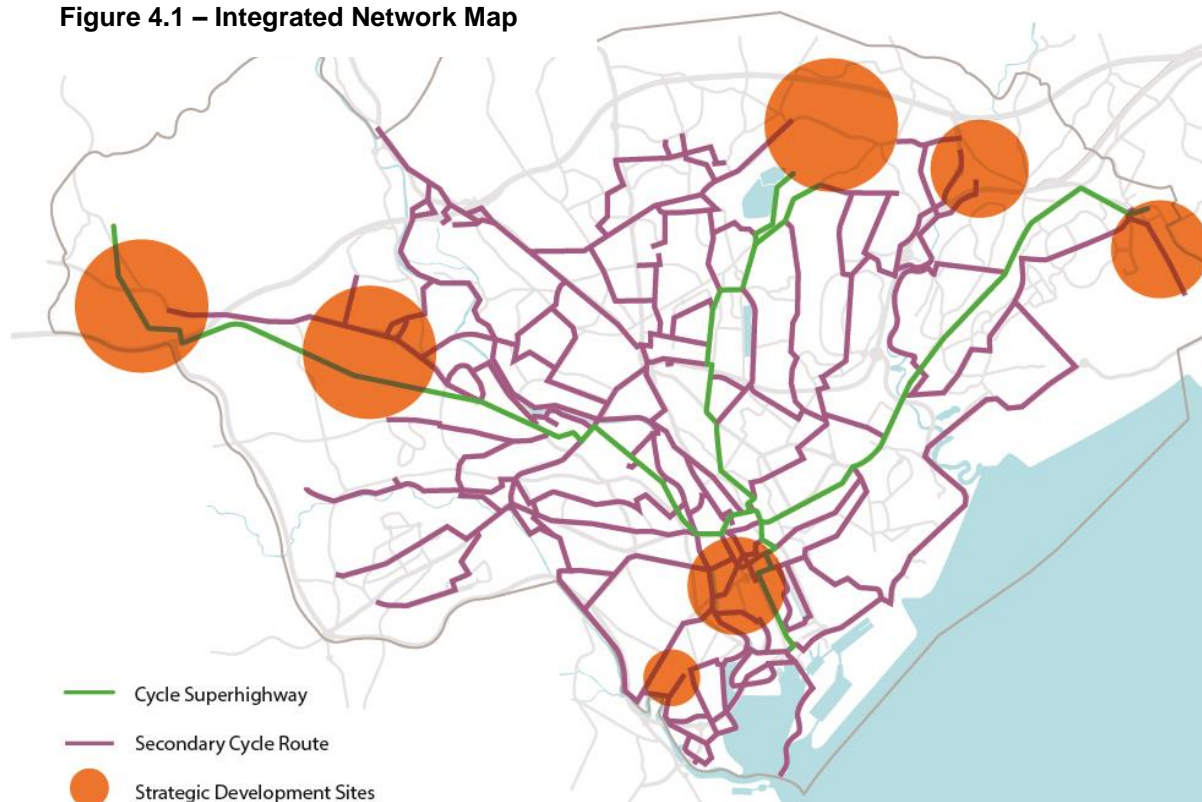
partners from employers, retail and schools to ensure that appropriate cycling facilities are provided at destinations and to promote cycling.

Infrastructure improvements for walking and cycling are planned and prioritised through the Integrated Network Map (INM) as detailed in **Figure 4.1**. The INM defines a network of walking routes and cycling routes and a schedule of schemes to improve this network of routes over a 15 year period. In accordance with the requirements of the Active Travel Act, the INM will be submitted to the Welsh Ministers for approval in November 2017 and updated every 3 years.



The Cycling Strategy and INM sets out proposals for two new cycle superhighways which will provide high quality cycle routes, segregated from pedestrians and motor vehicles on busy roads, and will connect strategic development sites, existing residential areas, employment sites, the city centre and Cardiff Bay. These will be supported by a network of secondary routes.

**Figure 4.1 – Integrated Network Map**

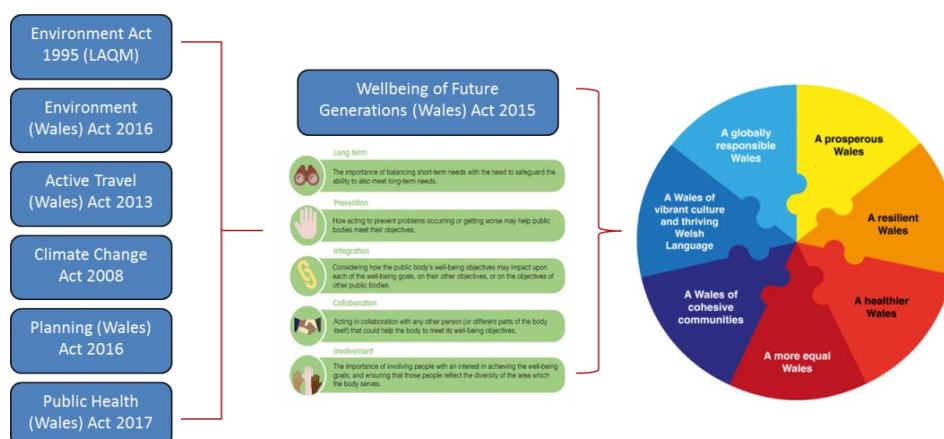


## 4.4 Local Authorities Well-being Objectives

In 2015 Welsh Government made a new law called the Well-being of Future Generations (Wales) Act. The new law has the sustainable development principle at its heart. This means that we need to work in a way that improves wellbeing for people today without doing anything that could make things worse for future generations.

As highlighted in the earlier **Figure 1.5**, there are seven national well-being goals that form the basis of the Act and five ways of working which support the goals.

**Figure 1.5- The Well- being of Future Generations (Wales) Act 2015 Matrix**



CC adopts the principles of The Well-being of Future Generations (Wales) Act 2015. The Act is a significant enabler to improve air quality as it calls for sustainable cross-sector action based on the principles of long-term, prevention-focused integration, collaboration and involvement. It intends to improve economic, social, environmental and cultural well-being in Wales to ensure the needs of the present are met without compromising the ability of future generations to meet their own needs.

## 4.5 Green Infrastructure Plans and Strategies

Outlined in Cardiff's Local Development Plan (LDP) 2006- 2021, Policy **KP16** focuses upon Green infrastructure.

### Policy KP16

#### Green Infrastructure

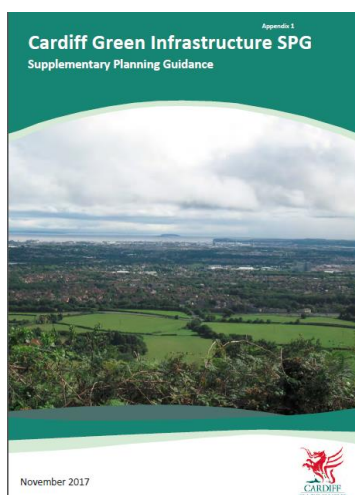
The policy aims to ensure that Cardiff's green infrastructure assets are strategically planned and delivered through a green infrastructure network. Other policies in the Plan provide more detailed guidance on aspects of these assets, together with supporting SPG.

Where development is permitted, planning conditions and/or obligations will be used to protect or enhance the natural heritage network.

New developments should incorporate new and / or enhanced green infrastructure of an appropriate size, type and standard to ensure no fragmentation or loss of connectivity.

Where the benefits of development outweigh the conservation interest, mitigation and/or compensation measures will be required to offset adverse effects and appropriate planning obligations sought. The implementation of policies designed to provide and protect public open space throughout Cardiff would also serve to offset any increase in recreational pressure on the Cardiff Beech Woods SAC, thereby helping to avoid likely significant effect upon that site.

Management of Cardiff's green infrastructure network should be in place prior to development, and appropriate planning obligations sought. SPG on this topic will more fully outline the extent of Cardiff's green infrastructure and how this policy can be implemented in more detail.



As previously mentioned a new Supplementary Planning Guidance (SPG) concerning Green Infrastructure was approved in 2017 by CC to provide a detailed understanding to the elements raised in the LDP.

- This document provides planning advice on a number of areas relating to development and the environment, including protection and provision of open space, ecology and biodiversity, trees, soils, public rights of way, and river corridors.

- The new document also differs from previous SPGs by providing more in depth design advice, aimed at giving developers a clearer understanding of the approach expected when submitting designs for new developments. By having this information up-front developers are better able to provide suitable designs to the Council through the planning process

## 4.6 Climate Change Strategies

Outlined in Cardiff's Local Development Plan (LDP) 2006- 2021, Policy **KP15** focuses upon Climate Change.

### **Policy KP15**

#### **Climate Change**

A core function of the Plan is to ensure that all development in the city is sustainable, taking full account of the implications of reducing resource use and addressing climate change. This Policy provides a framework for sustainable growth by promoting development that mitigates the causes of climate change and which is able to adapt to its likely effects. This long-term approach is vital if Cardiff is to realise the economic, environmental and social objectives set out in the Vision.

**To mitigate the effects of climate change and adapt to its impacts, development proposals should take into account the following factors:**

- **Reducing carbon emissions;**
- **Protecting and increasing carbon sinks;**
- **Adapting to the implications of climate change at both a strategic and detailed design level;**
- **Promoting energy efficiency and increasing the supply renewable energy; and**
- **Avoiding areas susceptible to flood risk in the first instance in accordance with the sequential approach set out in national guidance; and**
- **Preventing development that increases flood risk.**

## **5. Conclusions and Proposed Actions**

### **5.1 Conclusions from New Monitoring Data**

Monitoring data for 2017 indicates that annual mean concentrations of nitrogen dioxide recorded at sites of relevant exposure, within the already established AQMAs, continue to be elevated or exceed the annual mean NO<sub>2</sub> Air Quality Standard (40µg/m<sup>3</sup>).

It is also noted that sites 86 and 159 display increased levels in annual average NO<sub>2</sub> with annual readings recorded as;

Sites 86- 37.0µg/m<sup>3</sup>

Site 159- 38.6µg/m<sup>3</sup>

It has been suggested that these sites are susceptible to further examination following a review of 2018's complete dataset.

### **5.2 Conclusions relating to New Local Developments/ Sources**

Section 3.5 details a number of local developments which have either gained planning consent recently or for which a planning application has been received.

These applications have been handled accordingly where Air Quality Assessments have been produced and conditions applied accordingly.

### **5.3 Other Conclusions**

There are no other conclusions to be drawn from the information provided herein.

### **5.4 Proposed Actions**

As a result of the information provided herein it is proposed to

1. Produce and publish Cardiff Council's Clean Air Strategy and AQAP in 2018.
2. Continue monitoring within and around the existing AQMAs and other areas of concern. The diffusion tube network appointed by SRS on behalf of Cardiff Council will be examined.



3. Continue to drive Air Quality as a major aspect to be considered during any planning applications, most importantly Cardiff Central Development.
4. Submit an Annual Progress Report (APR) in 2018.

## References

Department for Environment, Food and Rural Affairs, 2003. *Part IV of the Environment Act 1995, Environment (Northern Ireland) Order 2002 Part III Local Air Quality Management, Technical Guidance LAQM.TG(16)*. London: DEFRA (as updated February 2018).

Welsh Government, Local Air Quality Management in Wales, Policy Guidance, June 2017.

1. Air Quality (Wales) Regulations 2000, No. 1940 (Wales 138)
2. Air Quality (Amendment)(Wales) Regulations 2002, No. 3182 (Wales 298)
3. The County Council of the City and County of Cardiff (The Philog Air Quality Management (NO<sub>2</sub>)) Order 2000
4. The County Council of the City and County of Cardiff (The Newport Road Air Quality Management (NO<sub>2</sub>)) Order 2000
5. The County Council of the City and County of Cardiff (The Cardiff West Air Quality Management (NO<sub>2</sub>)) Order 2000
6. The County Council of the City and County of Cardiff (The St Mary Street Air Quality Management (NO<sub>2</sub>)) Order 2002
7. The County Council of the City and County of Cardiff (Ely Bridge Air Quality Management (NO<sub>2</sub>)) Order 2007
8. The County Council of the City and County of Cardiff (Stephenson Court Air Quality Management (NO<sub>2</sub>)) Order 2010
9. The County Council of the City and County of Cardiff (Cardiff City Centre Air Quality Management (NO<sub>2</sub>)) Order 2013
10. The County Council of the City and County of Cardiff (Llandaff Air Quality Management (NO<sub>2</sub>)) Order 2013
11. Welsh Government, Local air quality management in Wales, Policy Guidance, June 2017
12. Cardiff Council 2003 Updating and Screening Assessment
13. Cardiff Council 2004 Progress Report
14. Cardiff Council 2005 Progress Report
15. Cardiff Council 2006 Updating and Screening Assessment
16. Cardiff Council 2007 Progress Report
17. Cardiff Council 2008 Progress Report
18. Cardiff Council 2009 Updating and Screening Assessment
19. Cardiff Council 2010 Progress Report
20. Cardiff Council 2011 Progress Report
21. Cardiff Council 2012 Updating and Screening Assessment
22. Cardiff Council Detailed Assessment for Stephenson Court
23. Cardiff Council 2012 Further Assessment for Stephenson Court
24. Cardiff Local Transport Plan 2000-2016
25. Cardiff Annual Progress Report for Transport 2009
26. Regional Transport Plan for South Wales
27. Cardiff Council Ely Bridge Air Quality Action Plan 2009
28. Cardiff Council St Mary Street Air Quality Action Plan 2010
29. Cardiff Council Detailed Assessment for Llandaff
30. Cardiff Council Detailed Assessment for Westgate Street
31. Cardiff Council 2014 Further Assessment for Cardiff City Centre

32. Cardiff Council 2014 Further Assessment for Llandaff
33. Cardiff Council 2014 Detailed Assessment for Fair Oak Road Roundabout
34. Cardiff Council 2014 Progress Report
35. City of Cardiff Council Local Transport Plan 2015- 2020
36. Cardiff Local Development Plan 2006- 2026
37. Cardiff Council 2015 Updating and Screening Assessment
38. Cardiff Council 2016 Progress Report
39. Cardiff Council 2017 Progress Report

## Appendices

Appendix A: Monthly Diffusion Tube Monitoring Results

Appendix B: A Summary of Local Air Quality Management

Appendix C: Air Quality Monitoring Data QA/QC

**Table A.2 – Full Monthly Diffusion Tube Results for 2017**

LAQM Annual Progress Report 2018



**Notes:**

Exceedances of the NO<sub>2</sub> annual mean objective of 40µg/m<sup>3</sup> are shown in **bold**.

NO<sub>2</sub> annual means exceeding 60µg/m<sup>3</sup>, indicating a potential exceedance of the NO<sub>2</sub> 1-hour mean objective are shown in **bold and underlined**.

(1) See Appendix C for details on bias adjustment and annualisation.

(2) Distance corrected to nearest relevant public exposure.

## Appendix B: A Summary of Local Air Quality Management

### Purpose of an Annual Progress Report

This report fulfils the requirements of the Local Air Quality Management (LAQM) process as set out in the Environment Act 1995 and associated government guidance. 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 being achieved. Where exceedances occur, or are likely to occur, the local authority must then declare an Air Quality Management Area (AQMA) and prepare a **DRAFT** Air Quality Action Plan (AQAP) within 18 months, setting out measures it intends to put in place to improve air quality in pursuit of the air quality objectives. The AQAP must be **formally** adopted prior to 24 months has elapsed. Action plans should then be reviewed and updated where necessary at least every 5 years.

For Local Authorities in Wales, an Annual Progress Report replaces all other formal reporting requirements and have a very clear purpose of updating the general public on air quality, including what ongoing actions are being taken locally to improve it if necessary.

### 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 B.2**.

The 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 exceedances in each year that are permitted (where applicable).

**Table B.2 – 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	
<b>Nitrogen Dioxide (NO<sub>2</sub>)</b>	200µg/m <sup>3</sup> not to be exceeded more than 18 times a year	1-hour mean	31.12.2005
	40µg/m <sup>3</sup>	Annual mean	31.12.2005
<b>Particulate Matter (PM<sub>10</sub>)</b>	50µg/m <sup>3</sup> , not to be exceeded more than 7 times a year	24-hour mean	31.12.2010
	18µg/m <sup>3</sup>	Annual mean	31.12.2010
<b>Particulate Matter (PM<sub>2.5</sub>)</b>	10µg/m <sup>3</sup>	Annual mean	31.12.2020
<b>Sulphur dioxide (SO<sub>2</sub>)</b>	350µg/m <sup>3</sup> , not to be exceeded more than 24 times a year	1-hour mean	31.12.2004
	125µg/m <sup>3</sup> , not to be exceeded more than 3 times a year	24-hour mean	31.12.2004
	266µg/m <sup>3</sup> , not to be exceeded more than 35 times a year	15-minute mean	31.12.2005
<b>Benzene</b>	3.25µg/m <sup>3</sup>	Running annual mean	31.12.2010
<b>1,3 Butadiene</b>	2.25µg/m <sup>3</sup>	Running annual mean	31.12.2003
<b>Carbon Monoxide</b>	10.0mg/m <sup>3</sup>	Running 8-Hour mean	31.12.2003
<b>Lead</b>	0.25µg/m <sup>3</sup>	Annual Mean	31.12.2008

## Appendix C: Air Quality Monitoring Data QA/QC

### Diffusion Tube Bias Adjustment Factors

A database of bias adjustment factors determined from Local Authority co-location studies throughout the UK has been collated by the LAQM Helpdesk. The National Diffusion Tube Bias Adjustment Factor Spreadsheet (Version 06/18) was used to obtain an overall adjustment factor of 0.77 from the input data shown in the following screen shot. This overall factor is based on 29 co-location studies where the tube preparation method and analysis laboratory used were the same as those used by CC.

**Figure C.1: National Diffusion Tube Bias Adjustment Factor Spreadsheet**

National Diffusion Tube Bias Adjustment Factor Spreadsheet							Spreadsheet Version Number: 06/18			
Follow the steps below <u>in the correct order</u> to show the results of <u>relevant</u> co-location studies							This spreadsheet will be updated at the end of September 2018 <a href="#">LAQM Helpdesk Website</a>			
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 spreadsheet will be updated every few months; the factors may therefore be subject to change. This should not discourage their immediate use.										
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>1</sup> shown in <b>blue</b> at the foot of the final column.						
If a laboratory is not shown, we have no data for this laboratory.		If a 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.	If you have your own co-location study then see footnote <sup>1</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>1</sup>	Year <sup>1</sup>	Site Type	Local Authority	Length of Study (months)	Diffusion Tube Mean Conc. (Dm) (µg/m <sup>3</sup> )	Automatic Monitor Mean Conc. (Cm) (µg/m <sup>3</sup> )	Bias (B)	Tube Precision <sup>1</sup>	Bias Adjustment Factor (A) (Cm/Dm)
ESG Didcot	50% TEA in acetone	2017	R	Tunbridge Wells	12	56	40	38.2%	G	0.72
ESG Didcot	50% TEA in acetone	2017	UB	Kingston upon Hull City Council	12	32	23	38.2%	G	0.72
ESG Didcot	50% TEA in acetone	2017	UB	Kingston upon Hull City Council	12	32	23	38.2%	G	0.72
ESG Didcot	50% TEA in acetone	2017	R	Suffolk Coastal DC	12	45	37	23.8%	G	0.81
ESG Didcot	50% TEA in acetone	2017	R	Dacorum Borough Council	9	31	27	14.7%	G	0.87
ESG Didcot	50% TEA in acetone	2017	R	North East Lincolnshire Council	11	37	24	53.5%	G	0.65
ESG Didcot	50% TEA in acetone	2017	UB	Swansea Council	10	17	14	23.4%	G	0.81
ESG Didcot	50% TEA in acetone	2017	R	Swansea Council	12	33	24	34.5%	G	0.74
ESG Didcot	50% TEA in acetone	2017	Overall Factor <sup>1</sup> (29 studies)					Use		0.77

### Discussion of Choice of Factor to use

The bias adjustment factor applied to all 2017 data is 0.77. The applied bias adjustment factor has been calculated using the national diffusion tube bias adjustment factor spreadsheet version 06/18. The individual bias adjustment factor calculated using the Cardiff City Centre AURN automatic monitoring system and the co-located triplicate diffusion tubes has not been adopted as the bias adjustment factor derived from the study was slightly less than the figure generated by the national, 0.74 compared to 0.77. Therefore it was deemed good practise to use the nationally derived bias adjustment factor as this would reflect a “worst-case scenario”.

## Short-Term to Long-Term Data Adjustment

### Diffusion Tubes Adjustment

The Nitrogen Dioxide (NO<sub>2</sub>) obtained via the use of passive diffusion tubes during January to December 2017 were annualised via the method described in Box 7.10 of LAQM TG(16). As Cardiff City Centre AURN is defined by DEFRA as an Urban Background location, this site was selected to annualise any applicable data.

**Table C.1– Long term AURN site used for calculation of nitrogen dioxide annualisation ratio for Diffusion Tube 47**

Site	Site Type	Annual Mean (µg/m <sup>3</sup> )	Period Mean (µg/m <sup>3</sup> )	Ratio
Cardiff City Centre AURN	Urban Background	19.97	20.10	0.99

**Table C.2 – Long term AURN site used for calculation of nitrogen dioxide annualisation ratio for Diffusion Tube 58**

Site	Site Type	Annual Mean (µg/m <sup>3</sup> )	Period Mean (µg/m <sup>3</sup> )	Ratio
Cardiff City Centre AURN	Urban Background	19.97	20.96	0.95

**Table C.3 – Long term AURN site used for calculation of nitrogen dioxide annualisation ratio for Diffusion Tube 101/102/103**

Site	Site Type	Annual Mean (µg/m <sup>3</sup> )	Period Mean (µg/m <sup>3</sup> )	Ratio
Cardiff City Centre AURN	Urban Background	19.97	23.73	0.84

**Table C.4– Long term AURN site used for calculation of nitrogen dioxide annualisation ratio for Diffusion Tube 107**

Site	Site Type	Annual Mean (µg/m <sup>3</sup> )	Period Mean (µg/m <sup>3</sup> )	Ratio
Cardiff City Centre AURN	Urban Background	19.97	19.6	1.02

**Table C.5 – Long term AURN site used for calculation of nitrogen dioxide annualisation ratio for Diffusion Tube 119**

Site	Site Type	Annual Mean (µg/m <sup>3</sup> )	Period Mean (µg/m <sup>3</sup> )	Ratio
Cardiff City Centre AURN	Urban Background	19.97	20.96	0.95



**Table C.6 – Long term AURN site used for calculation of nitrogen dioxide annualisation ratio for Diffusion Tube 126**

Site	Site Type	Annual Mean ( $\mu\text{g}/\text{m}^3$ )	Period Mean ( $\mu\text{g}/\text{m}^3$ )	Ratio
Cardiff City Centre AURN	Urban Background	19.97	19.98	1.00

**Table C.7 – Long term AURN site used for calculation of nitrogen dioxide annualisation ratio for Diffusion Tube 134**

Site	Site Type	Annual Mean ( $\mu\text{g}/\text{m}^3$ )	Period Mean ( $\mu\text{g}/\text{m}^3$ )	Ratio
Cardiff City Centre AURN	Urban Background	19.97	21.03	0.95

**Table C.8 – Long term AURN site used for calculation of nitrogen dioxide annualisation ratio for Diffusion Tube 143**

Site	Site Type	Annual Mean ( $\mu\text{g}/\text{m}^3$ )	Period Mean ( $\mu\text{g}/\text{m}^3$ )	Ratio
Cardiff City Centre AURN	Urban Background	19.97	20.96	0.95

**Table C.9 – Long term AURN site used for calculation of nitrogen dioxide annualisation ratio for Diffusion Tube 144**

Site	Site Type	Annual Mean ( $\mu\text{g}/\text{m}^3$ )	Period Mean ( $\mu\text{g}/\text{m}^3$ )	Ratio
Cardiff City Centre AURN	Urban Background	19.97	20.96	0.95

**Table C.10 – Long term AURN site used for calculation of nitrogen dioxide annualisation ratio for Diffusion Tube 160**

Site	Site Type	Annual Mean ( $\mu\text{g}/\text{m}^3$ )	Period Mean ( $\mu\text{g}/\text{m}^3$ )	Ratio
Cardiff City Centre AURN	Urban Background	19.97	20.96	0.95

**Table C.11– Long term AURN site used for calculation of nitrogen dioxide annualisation ratio for Diffusion Tube 179**

Site	Site Type	Annual Mean ( $\mu\text{g}/\text{m}^3$ )	Period Mean ( $\mu\text{g}/\text{m}^3$ )	Ratio
Cardiff City Centre AURN	Urban Background	19.97	23.73	0.84

**Table C.12– Long term AURN site used for calculation of nitrogen dioxide annualisation ratio for Diffusion Tube 180**

Site	Site Type	Annual Mean ( $\mu\text{g}/\text{m}^3$ )	Period Mean ( $\mu\text{g}/\text{m}^3$ )	Ratio
Cardiff City Centre AURN	Urban Background	19.97	22.78	0.88

**Table C.13– Long term AURN site used for calculation of nitrogen dioxide annualisation ratio for Diffusion Tube 181**

Site	Site Type	Annual Mean ( $\mu\text{g}/\text{m}^3$ )	Period Mean ( $\mu\text{g}/\text{m}^3$ )	Ratio
Cardiff City Centre AURN	Urban Background	19.97	22.78	0.88

**Table C.14– Long term AURN site used for calculation of nitrogen dioxide annualisation ratio for Diffusion Tube 184**

Site	Site Type	Annual Mean ( $\mu\text{g}/\text{m}^3$ )	Period Mean ( $\mu\text{g}/\text{m}^3$ )	Ratio
Cardiff City Centre AURN	Urban Background	19.97	21.2	0.94

**Table C.15– Long term AURN site used for calculation of nitrogen dioxide annualisation ratio for Diffusion Tube 185**

Site	Site Type	Annual Mean ( $\mu\text{g}/\text{m}^3$ )	Period Mean ( $\mu\text{g}/\text{m}^3$ )	Ratio
Cardiff City Centre AURN	Urban Background	19.97	26.00	0.77

**Table C.16– Long term AURN site used for calculation of nitrogen dioxide annualisation ratio for Diffusion Tube 186**

Site	Site Type	Annual Mean ( $\mu\text{g}/\text{m}^3$ )	Period Mean ( $\mu\text{g}/\text{m}^3$ )	Ratio
Cardiff City Centre AURN	Urban Background	19.97	19.92	1.00

**Table C.17– Long term AURN site used for calculation of nitrogen dioxide annualisation ratio for Diffusion Tube 187**

Site	Site Type	Annual Mean ( $\mu\text{g}/\text{m}^3$ )	Period Mean ( $\mu\text{g}/\text{m}^3$ )	Ratio
Cardiff City Centre AURN	Urban Background	19.97	22.10	0.90

**Table C.18– Long term AURN site used for calculation of nitrogen dioxide annualisation ratio for Diffusion Tube 188**

Site	Site Type	Annual Mean ( $\mu\text{g}/\text{m}^3$ )	Period Mean ( $\mu\text{g}/\text{m}^3$ )	Ratio
Cardiff City Centre AURN	Urban Background	19.97	19.92	1.00

### QA/QC of Diffusion Tube Monitoring

The diffusion tubes are supplied and analysed by Environmental Scientifics Group Didcot, using the 50% triethanolamine (TEA) in water method. Environmental Scientifics Group Didcot participates in the Annual Field Inter-Comparison Exercise and Workplace Analysis Scheme for Proficiency (WASP) inter-comparison scheme for nitrogen dioxide diffusion tube analysis. From April 2014 the WASP Scheme was combined with the STACKS scheme to form the new AIR scheme, which Environmental Scientifics Group participates in. The AIR scheme is an independent analytical proficiency testing scheme operated by LGC Standards and supported by the Health and Safety Laboratory (HSL).

The laboratory Environmental Scientifics Group Didcot is regarded ranked as the highest rank of satisfactory in relation to the WASP intercomparison scheme for spiked Nitrogen Dioxide diffusion tubes. Information regarding tube precision can be obtained via <http://laqm.defra.gov.uk/diffusion-tubes/precision.html> Information regarding WASP results can be obtained via <http://laqm.defra.gov.uk/diffusion-tubes/qa-qc-framework.html>

## Glossary of Terms

Abbreviation	Description
AQAP	Air Quality Action Plan - A detailed description of measures, outcomes, achievement dates and implementation methods, showing how the LA intends to achieve air quality limit values'
AQA	Air Quality Assessment
AQMA	Air Quality Management Area – An area where air pollutant concentrations exceed / are likely to exceed the relevant air quality objectives. AQMAs are declared for specific pollutants and objectives
APR	Air quality Annual Progress Report
AURN	Automatic Urban and Rural Network (UK air quality monitoring network)
CC	Cardiff Council
Defra	Department for Environment, Food and Rural Affairs
DMRB	Design Manual for Roads and Bridges – Air quality screening tool produced by Highways England
FDMS	Filter Dynamics Measurement System
LAQM	Local Air Quality Management
NO <sub>2</sub>	Nitrogen Dioxide
NO <sub>x</sub>	Nitrogen Oxides
PM <sub>10</sub>	Airborne particulate matter with an aerodynamic diameter of 10µm (micrometres or microns) or less
PM <sub>2.5</sub>	Airborne particulate matter with an aerodynamic diameter of 2.5µm or less
QA/QC	Quality Assurance and Quality Control
SO <sub>2</sub>	Sulphur Dioxide