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Llywodraeth Cymru
Welsh Government

Welsh Government
Consultation Document

Tackling roadside nitrogen dioxide concentrations in Wales

Welsh Government supplemental plan to the UK plan for tackling roadside nitrogen dioxide concentrations 2017

Date of issue: 25 April 2018
Action required: Responses by 19 June 2018

Mae'r ddogfen yma hefyd ar gael yn Gymraeg.
This document is also available in Welsh.

Overview

This consultation seeks views on the Welsh Government supplemental plan to the 'UK plan for tackling roadside nitrogen dioxide concentrations 2017 ("the 2017 Plan")'.

The Welsh Government supplemental plan ("WGSP") builds on Section 7.6 (Additional Actions in Wales) of the 2017 Plan and sets out actions the Welsh Government will take to ensure compliance within the shortest possible time with the limit values for nitrogen dioxide (NO_2) laid down by the Ambient Air Quality Directive (2008/50/EC) and the Air Quality Standards (Wales) Regulations 2010.

The Welsh Ministers accept the 2017 Plan does not, insofar as it relates to Wales, satisfy the requirements of the Ambient Air Quality Directive or the Air Quality Standards (Wales) Regulations 2010. This is because the Welsh Government did not, at the time when the 2017 Plan was drawn up, have sufficient information properly to consider what measures within their devolved competence (if any) would ensure compliance with the limit values for NO_2 laid down by the Directive and the Regulations within the shortest possible time.

The Welsh Ministers have given a court undertaking to publish and commence consultation on a draft supplement to the 2017 Plan which satisfies the requirements of the Directive and the Regulations, by 30 April 2018, following a judicial review of the 2017 Plan decided earlier this year[1]. This consultation and the accompanying WGSP are published to fulfil that undertaking. A final supplemental plan that complies with the Directive and the Regulations will be published on or before 31 July 2018 in accordance with the court undertaking.

This consultation document should be read against the 2017 Plan.

How to respond

Please use the consultation response form at Annex 1 of this document.

[1] R (on the application of ClientEarth) No.3 v Secretary of State for Environment, Food and Rural Affairs and others [2018] EWHC 315 (Admin).

Further information and related documents	**Large print, Braille and alternative language versions of this document are available on request.** Insert any references to the internet, documents or information which might to useful to consultees e.g. consultation web address, detailed appendix to consultation
Contact details	For further information: Address: Air Quality Policy Branch Welsh Government Cathays Park Cardiff CF10 3NQ email: AirQualityPolicy@gov.wales telephone: 03000 259420 & 03000 256379
Data protection	How the views and information you give us will be used Any response you send us will be seen in full by Welsh Government staff dealing with the issues which this consultation is about. It may also be seen by other Welsh Government staff to help them plan future consultations. The Welsh Government intends to publish a summary of the responses to this document. We may also publish responses in full. Normally, the name and address (or part of the address) of the person or organisation who sent the response are published with the response. This helps to show that the consultation was carried out properly. If you do not want your name or address published, please tell us this in writing when you send your response. We will then blank them out. Names or addresses we blank out might still get published later, though we do not think this would happen very often. The Freedom of Information Act 2000 and the Environmental Information Regulations 2004 allow the public to ask to see information held by many public bodies, including the Welsh Government. This includes information which has not been published. However, the law also allows us to withhold information in some circumstances. If anyone

asks to see information we have withheld, we will have to decide whether to release it or not. If someone has asked for their name and address not to be published, that is an important fact we would take into account. However, there might sometimes be important reasons why we would have to reveal someone's name and address, even though they have asked for them not to be published. We would get in touch with the person and ask their views before we finally decided to reveal the information.

Foreword

Tackling poor air quality is a priority for the Welsh Government and this is reflected in our national strategy – 'Prosperity for All'. The Welsh Government is committed to building healthier communities and better environments. The contribution made by the environment to good health cannot be overstated. The actions we take to improve air quality in Wales have a key role in supporting the right conditions for better health, well-being and greater physical activity. We will reduce emissions and deliver vital improvements in air quality through planning, infrastructure, regulation, and health communication measures.

The Welsh Government is working actively, alongside the other devolved administrations, to to meet our joint objective with the UK Government to transform the UK's most polluted towns and cities into clean and healthy urban spaces, supporting those most directly affected and ensuring that vehicle manufacturers play their part to improve the nation's air quality.

We welcome your views on the Welsh Governments supplemental plan to the UK plan for tackling roadside nitrogen dioxide concentrations 2017. Its sets out how we will reduce concentrations of nitrogen dioxide around roads where levels are above legal limits in Wales. We will achieve statutory limit values for Wales by ensuring the implementation of required measures within the shortest possible time.

Minister for Environment, Cabinet Secretary for Energy, Planning and Rural Affairs and Cabinet Secretary for Economy and Transport.

Main issue

1. This consultation seeks your views on the draft WGSP at **Annex A** which sets out how the Welsh Government will reduce concentrations of NO_2 around roads where levels are above legal limits in the shortest possible time.

2. The WGSP should be read in conjunction with the UK Air Quality Plan for tackling roadside nitrogen dioxide concentrations 2017 (the 2017 Plan)[2], the Air Quality Plan for tackling roadside nitrogen dioxide in South Wales (UK0041)[3], the Air Quality Plan for tackling roadside nitrogen dioxide in North Wales (UK0042)[4], the Air Quality Plan for tackling roadside nitrogen dioxide concentrations in Cardiff Urban Area (UK0026) [5] and the Air Quality Plan for tackling roadside nitrogen dioxide concentrations in Swansea Urban Area (UK0027)[6].

Impacts of air pollution in Wales

3. The Welsh Government is committed to improving outdoor air quality in Wales, but it is clear we face significant challenges in doing so. Air pollution impacts on public health, the natural environment, and the economy.

Air pollution and health

4. Outdoor air pollution is a significant environmental determinant of health[7]. Exposure can adversely affect health, particularly amongst vulnerable population groups. The pollutants of most widespread concern in the context of air quality management are particulate matter (PM) and nitrogen dioxide (NO_2), but as air pollution is a complex mixture of gases, other pollutants may also affect health[8]:

Particulate matter (PM_{10}, $PM_{2.5}$)

5. Particulate matter is a term that refers to tiny particles of varying chemical composure less than 2.5µm ($PM_{2.5}$) or 10µm (PM_{10}) in diameter. When inhaled, particles less than 10µm in diameter (the PM_{10} 'thoracic' fraction) can penetrate, and get deposited in, the human upper respiratory tract; particles less than 2.5µm in diameter (the fine $PM_{2.5}$ 'respirable' fraction') can penetrate deep into the alveoli of the lungs. Both have the same biological mechanism which causes the lining of the lungs to become inflamed. Through a process of oxidative stress, this places pressure on, and compromises the function of, various body systems. Short-term exposure can result in eye, nose and throat irritation, asthma symptom exacerbation, headaches and nausea. Long-term exposure increases morbidity and mortality risks from heart disease and strokes, respiratory diseases, lung cancer and other effects[9].

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[2] The UK Air Quality Plan for tackling roadside nitrogen dioxide concentrations 2017 - Https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/633270/air-quality-plan-detail.pdf
[3] The Air Quality Plan for tackling roadside nitrogen dioxide in South Wales (UK0041) - Https://uk-air.defra.gov.uk/assets/documents/no2ten/2017-zone-plans/AQplans_UK0041.pdf
[4] The Air Quality Plan for tackling to roadside nitrogen dioxide in North Wales (UK0042) - Https://uk-air.defra.gov.uk/assets/documents/no2ten/2017-zone-plans/AQplans_UK0042.pdf.
[5] Air Quality Plan for tackling roadside nitrogen dioxide concentrations in Cardiff Urban Area 2017 – Https://uk-air.defra.gov.uk/assets/documents/no2ten/2017-zone-plans/AQplans_UK0026.pdf
[6] Air Quality Plan for tackling roadside nitrogen dioxide concentrations in Swansea Urban Area (UK0027) 2017 – Https://uk-air.defra.gov.uk/assets/documents/no2ten/2017-zone-plans/AQplans_UK0027.pdf
[7] World Health Organization (2015). Economic cost of the health impact of air pollution in Europe: Clean air, health and wealth. WHO: Copenhagen, Denmark.
[8] http://www.euro.who.int/__data/assets/pdf_file/0006/298482/Health-risk-assessment-air-pollution-General-principles-en.pdf?ua=1
[9] World Health Organization (2013). Review of evidence on health aspects of air pollution–REVIHAAP. WHO: Copenhagen, Denmark.

6. Particulate matter from road transport sources comprises primary particles emitted directly to atmosphere from combustion sources, tyre and brake wear, and secondary particles formed by chemical reactions in the air.

Nitrogen dioxide, sulphur dioxide and ozone

7. These gases irritate the airways of the lungs, increasing symptoms of those suffering from lung diseases. Short-term exposure to nitrogen dioxide is associated with increased cardiovascular and respiratory morbidity.

8. All combustion processes in air produce oxides of nitrogen (NO_X) that include nitrogen dioxide; and all combustion process of fuels containing sulphur produce sulphur dioxide. Non-methane volatile organic compounds emitted from combustion of fuels such as petrol can react with other atmospheric pollutants, primarily NO_x, to produce ozone.

9. In the UK each year, it is estimated that the equivalent of 29,000 deaths[10,11] are attributed to long-term exposure to fine particulate matter ($PM_{2.5}$) air pollution, and the equivalent of 23,500 deaths[12] are attributed to long-term nitrogen dioxide (NO_2) exposure. Accounting for the potential overlapping health effects of PM and NO_2 (believed to be around 30%), it is estimated that the equivalent of 40,000 deaths occur annually in the UK as a result of exposure to outdoor pollution[13]. On average, exposure reduces the life expectancy of every person in the UK by 7 to 8 months[14]. The societal cost of air pollution (accounting for health service costs and reduced productivity through lost work-days) in the UK is significant, standing at around £20bn every year[15].

Air pollution and the environment

10. Air pollution results in damage to the natural environment. NO_2 contributes to acidification, where chemical reactions involving air pollutants create acidic compounds which when deposited on land and aquatic systems can cause harm to soils, vegetation and buildings. It also contributes to eutrophication, where nitrogen can be deposited in soils or in rivers and lakes through rain, affecting the nutrient levels and diversity of species in sensitive environments, for example encouraging algae growth in lakes and water courses. In addition, it contributes to ground-level ozone which can damage wild plants, crops, forests and some materials, and is a greenhouse gas contributing to global warming[16].

[10] Gowers, A.M., Miller, B.G., Stedman, JR (2014). Estimating Local Mortality Burdens Associated with Particulate Air Pollution. Public Health England: London, UK.
[11] COMEAP (2010). The Mortality Effects of Long-Term Exposure to Particulate Air Pollution in the United Kingdom. COMEAP.
[12] Defra (2015). Draft Plans to Improve Air Quality in the UK: Tackling Nitrogen Dioxide in Our Towns and Cities. UK Overview Document. Defra: London, UK.
[13] Royal Colleges of Physicians and Paediatrics Child Health (2016). *Every breath we take – the lifelong impact of air pollution*. London: Royal College of Physicians.
[14] Defra (2007). The Air Quality Strategy for England, Scotland, Wales and Northern Ireland (volume 1). Defra: London, UK.
[15] Royal Colleges of Physicians and Paediatrics Child Health (2016). *Every breath we take – the lifelong impact of air pollution*. London: Royal College of Physicians.
[16] National Statistics (2016) Emissions of air pollutants in the UK, 1970 to 2015 www.gov.uk/government/statistics/emissions-of-air-pollutants.

Pollution sources

11. The principal source of particulate matter and nitrogen dioxide affecting people is road transport emissions, but other transport sources as well as industrial, agricultural, domestic and natural sources also contribute (Fig.1).

Fig.1. Principal sources of outdoor air pollution
(source: Defra,
http://www.local.gov.uk/sites/default/files/documents/6.3091_DEFRA_AirQualityGuide_9web_0.pdf)

12. Pollutants may not only cause problems locally in the immediate vicinity of sources; if suspended in air they can travel long distances and affect more people over wider geographical areas. This calls for action at international, national, regional and local levels.

The Role of the Welsh Government under the Legislative Framework

13. The Council Directive 2008/50/EC on Ambient Air Quality and Cleaner Air for Europe ("the Directive") imposes various obligations on the United Kingdom in relation to air quality.

14. At the domestic level, responsibility for implementing the Directive is a devolved matter, and the Welsh Ministers are the competent authority in respect of Wales. The Directive is implemented in Wales by way of the Air Quality Standards (Wales) Regulations 2010 ("the Welsh Regulations").

15. The Welsh Government's ability to take action in relation to air quality is limited to taking steps that fall within the scope of its devolved competence. The Welsh Government engages with the United Kingdom Government on relevant matters that are outside its devolved competence, such as vehicle specification standards, vehicle excise duty, fuel duty, and the enforcement of Euro emission standards (all of which are matters for the United Kingdom Government).

16. In broad terms, the Welsh Government's obligations under the Directive and the Regulations are as follows:

i. Wales must be divided into zones and agglomerations. Wales has been divided into two zones (North Wales and South Wales) and two agglomerations (Cardiff Urban Area and Swansea Urban Area).

ii. Insofar as is relevant, an agglomeration is treated in the same way as a zone.

iii. The Welsh Government must ensure that the level of NO_2 in any zone or agglomeration does not exceed the relevant limit values set out in the Directive and the Welsh Regulations.

iv. Where the level of NO_2 in any zone exceeds a relevant limit value, the Welsh Government must draw up and implement an air quality plan to achieve the limit value in that zone or agglomeration. Where the Welsh Government proposes to

prepare, modify or review such an air quality plan, they must consult the public. The WGSP is being consulted on in recognition of this obligation.

v. An air quality plan must include measures intended to ensure compliance with the relevant limit value within the shortest time possible. The Welsh Government must choose a route to that objective which ensures compliance with the limit value as quickly as possible, and take steps which mean meeting the NO_2 limit values is not just possible, but likely[17].

Limit Values for NO_2

17. The Directive and the Welsh Regulations provide for an hourly and an annual limit value for NO_2:

i) an hourly limit value of an average of 200 micrograms per cubic metre(which must not be exceeded more than 18 times in a calendar year);
ii) an annual limit value of an average of 40 micrograms per cubic metre.

18. The annual assessment of compliance is based on a combination of information from the UK national monitoring networks and the results of modelling assessments. The Directive sets out how monitoring for the purpose of compliance assessment should be undertaken, including how many stations are required and detailed criteria on where to locate stations and the equipment that should be used. The number of stations required is calculated for each pollutant for each zone and is based on an assessment of concentrations over a five year period, together with population information for that zone. In accordance with the requirements of the Directive, monitoring networks are reviewed periodically by the Department for the Environment, Food and Rural Affairs ("Defra") to ensure they remain compliant, with a minimum review requirement of once every 5 years.

19. There are several air quality monitoring networks operating across the UK, each with different objectives, scope and coverage and these are operated on behalf of Defra and the Devolved Administrations by the Environment Agency (EA). The Automatic Urban and Rural Network (AURN) is the largest automatic monitoring network in the UK and forms the bulk of the UK's statutory compliance monitoring evidence base, including for NO_2.

20. The Directive also allows use of supplementary assessment using modelling and the number of stations required is more flexible where modelling is used. UK compliance assessment modelling is undertaken using national models known as the Pollution Climate Mapping ("PCM") models. The PCM models have been designed to assess compliance with the limit values at locations defined within the Directive.

21. The air quality assessment for each pollutant is derived from a combination of measured and modelled concentrations. Where both measurements and model results are available, the assessment of compliance for each zone is based on the higher of the two. The air quality compliance assessment is submitted to the European Commission via e-Reporting. With respect to NO_2, any exceedances of the

[17] *R. (on the application of ClientEarth (No. 2)) v Secretary of State for the Environment, Food and Rural Affairs* [2016] EWHC 2740 (Admin), at paragraph 95(i) and *R (on the application of ClientEarth (No.3)) v Secretary of State for Environment, Food and Rural Affairs and others* [2018] EWHC 315 (Admin), at paragraph 73.

hourly or annual limit value, where measured or modelled, will result in non-compliance within the respective zone or agglomeration being assessed.

Implementation of Air Quality Plans for NO_2 in Wales

22. Defra coordinates assessment and air quality plans for the UK as a whole. Based on Defra's projections for the air quality plan for NO_2 published in 2015, all zones in Wales were predicted to be compliant with limit values by 2020 (the earliest date in respect of which projections were made) or earlier.

23. However, evidence has emerged over recent years in relation to the real world emissions of NOx exceeding legal type approval emissions limits, on which modelling assumptions are based. This disparity has meant the projected reductions in emissions from the introduction of stricter European standards have not materialised to the degree expected, and the scale of projected non-compliance in Wales, and elsewhere in the UK, has changed significantly over time. UK-wide compliance projections produced in 2017, based on updated emission factors, now show predicted areas of non-compliance in Wales in 2020 and beyond, unless further measures are taken.

24. The Defra UK-wide assessment which informed the 2017 Plan indicated air quality issues for Wales where, without further action, non-compliance may exist in future years.

25. Section 7.6 of the 2017 Plan [18], the Air Quality Plan for tackling roadside nitrogen dioxide in South Wales (UK0041)[19] , the Air Quality Plan for tackling to roadside nitrogen dioxide in North Wales (UK0042)[20], the Air Quality Plan for tackling roadside nitrogen dioxide concentrations in Cardiff Urban Area (UK0026) [21]and the Air Quality Plan for tackling roadside nitrogen dioxide concentrations in Swansea Urban Area (UK0027)[22] identified actions to be taken by the Welsh Government to achieve statutory limit values for NO_2 in Wales within the shortest possible time. In summary these were to:

- consult on the detail for a Clean Air Zone Framework for Wales within 12 months of the publication of the 2017 Plan. This aims to ensure the effective implementation of Clean Air Zones in locations where they would bring about compliance with limit values before other measures and in the shortest possible time[23];
- work with Cardiff Council to ensure they undertake a local assessment to understand what measures are required to achieve statutory limit values for NO_2 in the Cardiff area within the shortest possible time[24];
- work with local authorities in areas where a Clean Air Zone would not be appropriate to identify specific local solutions on a case-by-case basis[25];

[18] Section 7.6 of the 2017 Plan – Page 45 – 49 – Paragraphs 148 - 164
[19] Air Quality Plan for tackling roadside nitrogen dioxide in South Wales (UK0041) 2017 – Https://uk-air.defra.gov.uk/assets/documents/no2ten/2017-zone-plans/AQplans_UK0041.pdf
[20] Air Quality Plan for tackling to roadside nitrogen dioxide in North Wales (UK0042)2017 – Https://uk-air.defra.gov.uk/assets/documents/no2ten/2017-zone-plans/AQplans_UK0042.pdf
[21] Air Quality Plan for tackling roadside nitrogen dioxide concentrations in Cardiff Urban Area 2017 – Https://uk-air.defra.gov.uk/assets/documents/no2ten/2017-zone-plans/AQplans_UK0026.pdf
[22] Air Quality Plan for tackling roadside nitrogen dioxide concentrations in Swansea Urban Area (UK0027) 2017 – Https://uk-air.defra.gov.uk/assets/documents/no2ten/2017-zone-plans/AQplans_UK0027.pdf
[23] Section 7.6 of the 2017 Plan – Page 46 – Paragraph 156
[24] Section 7.6 of the 2017 Plan – Page 46 - 47 – Paragraph 157 - 159
[25] Section 7.6 of the 2017 Plan – Page 47 – Paragraph 160

- continue to invest in measures to promote modal shift from and within road transport[26];
- review measures to improve NO_2 levels on the five stretches of the trunk road network across Wales where there are exceedances.
- review the siting of the monitoring station at Hafod-yr-ynys to ensure further local targeted, measures are effective and proportionate.

Why is the Welsh Government Consulting on a Supplemental Plan?

26. The Welsh Ministers accept the 2017 Plan does not satisfy the requirements of the Directive or the Welsh Regulations. This is because the Welsh Government did not, at the time when the 2017 Plan was drawn up, have sufficient information properly to consider what measures within their devolved competence (if any) would ensure compliance with the limit values for NO_2 laid down by the Directive and the Welsh Regulations within the shortest possible time.

27. The Welsh Ministers have given a court undertaking to publish and commence consultation on a draft supplement to the 2017 Plan which satisfies the requirements of the Directive and the Welsh Regulations, by 30 April 2018, following a judicial review of the 2017 Plan decided earlier this year[27]. This consultation and the accompanying WGSP are published to fulfil that undertaking. A final supplemental plan that complies with the Directive and Welsh Regulations will be published on or before 31 July 2018 in accordance with the court undertaking.

28. The timetables for taking the various steps set out in the WGSP, including those relating to steps to identify particular measures which will be likely to ensure compliance with the limit values within the shortest possible time, reflect those which were put forward by the Welsh Ministers in the evidence that they submitted to the court.[28]

The Welsh Government Supplemental Plan to the 'UK plan for tackling roadside nitrogen dioxide concentrations 2017'

29. Since the publication of the 2017 Plan, the Welsh Government has taken action to deliver and supplement the abovementioned actions with measures to achieve statutory limit values for NO_2 in Wales within the shortest possible time. The WGSP attached at **Annex A** sets out information on how we will achieve compliance with our statutory obligations as set out in the Directive and the Welsh Regulations. The information set out in the WGSP includes the following::

- The locations of excess pollution.
- General information about the type of zone, estimate of the polluted area (km^2) and of the population exposed to the pollution, useful climatic data, relevant data on topography and sufficient information on the type of targets requiring protection in the zone.
- Details about the bodies responsible for the development and implementation of the WGSP.

[26] Section 7.6 of the 2017 Plan – Page 47 - 48 – Paragraph 162
[27] *R (on the application of ClientEarth) No.3 v Secretary of State for Environment, Food and Rural Affairs and others* [2018] EWHC 315 (Admin).
[28] Although, in the event, the court did not expressly consider or comment on these timetables.

- The nature and assessment of pollution, including concentrations observed over previous years (before the implementation of the improvement measures), concentrations measured since the beginning of the project; and techniques used for the assessment.
- The origin of the pollution, including a list of the main emission sources responsible for the pollution, the total quantity of emissions from these sources and information on pollution imported from other regions.
- An analysis of the situation, including details of factors responsible for the exceedance of the limit values.
- Details of measures that will be implemented in the short-term which will possibly contribute to compliance with the limit values within the shortest possible time.
- Details of the steps that the Welsh Government will take, and will require relevant local authorities to take, in order to identify measures that will be implemented in the longer-term which will be likely to ensure compliance with the limit values within the shortest possible time.
- Details of measures or projects adopted with a view to reducing pollution following 11 June 2008. This includes a list and description of all the measures set out in the project, a timetable for implementation and an estimate of the improvement of air quality planned and of the expected time required to attain these objectives.
- Details of measures or projects planned or being researched for the long term.

Communicating implementation of action in the WGSP

30. The Welsh Government is committed to providing regular communications and updates about implementation of the required measures in the WGSP to achieve compliance with legal limits for NO_2 in the soonest time possible. This will include:

- Regular Welsh Government update announcements on implementation of compliance measures within the WGSP.
- Media and publicity to encourage behavioural change and ensure public awareness and understanding of measures being implemented to bring compliance in the soonest time possible.
- The Welsh Government will consult on a Clean Air Plan for Wales by the end of this year. This Plan will include an update on implementation of actions contained in the WGSP and further details about next steps being taken by the Welsh Government to ensure compliance with legal limits for NO_2 in the soonest time possible.

Consultation Response Form

Your name:

Organisation (if applicable):

email / telephone number:

Your address:

Question 1: Do you agree that the measures proposed in the WGSP for the Swansea Urban Area will deliver compliance with our statutory limit values for NO_2 within the shortest time possible? If not, please provide evidenced detail of measures which may achieve compliance sooner.
Question 2: Do you agree that the measures proposed in the WGSP for the Cardiff Urban Area will deliver compliance with our statutory limit values for NO_2 within the shortest time possible? If not, please provide evidenced detail of measures which may achieve compliance sooner.

Question 3: Do you agree that the measures proposed in the WGSP for the South Wales non-agglomeration zone will deliver compliance with our statutory limit values for NO_2 within the shortest time possible? If not, please provide evidenced detail of measures which may achieve compliance sooner.

Question 4: Do you agree that the measures proposed in the WGSP for the North Wales non-agglomeration zone will deliver compliance with our statutory limit values for NO_2 within the shortest time possible? If not, please provide evidenced detail of measures which may achieve compliance sooner.

Question 5: Could the proposed measures within the WGSP have any positive or adverse effects on the Welsh language, and how could the document increase the former/mitigate the latter?

Question 6: Do you wish to make any further comments in relation to the WGSP?

Please enter responses here:

Responses to consultations are likely to be made public, on the internet or in a report. If you would prefer your response to remain anonymous, please tick here:

The Welsh Government Supplemental Plan to the 'UK plan for tackling roadside nitrogen dioxide concentrations 2017'

Contents

The Welsh Government Supplemental Plan to the 'UK plan for tackling roadside nitrogen dioxide concentrations 2017'

Introduction

1. This document is the Welsh Government Supplemental Plan to the 'UK plan for tackling roadside nitrogen dioxide concentrations 2017' (WGSP), which supplements the 'UK plan for tackling roadside nitrogen dioxide concentrations 2017[29]' (the 2017 Plan).

2. This plan sets out actions the Welsh Government has taken since the publication of the 2017 Plan and is going to take to deliver our statutory limit values for NO_2 in Wales within the shortest possible time in accordance with Council Directive 2008/50/EC on Ambient Air Quality and Cleaner Air for Europe (the "Directive") and the Air Quality Standards (Wales) Regulations 2010 (the "Welsh Regulations"). This plan should be read in conjunction with the 2017 Plan. References to the relevant parts of the 2017 Plan have been included in this supplemental plan to assist cross referencing.

3. Defra coordinates assessment and air quality plans for the UK as a whole. Based on Defra's projections for the air quality plan for NO_2 published in 2015, all zones in Wales were predicted to be compliant with limit values by 2020 (the earliest projected date) or earlier.

4. Evidence has emerged over recent years in relation to the real world emissions of NOx exceeding legal type approval emissions limits, on which modelling assumptions are based. This disparity has meant the projected reductions in emissions from the introduction of stricter European standards have not materialised to the degree expected, and the scale of projected non-compliance in Wales, and elsewhere in the UK, has changed significantly over time. UK-scale compliance projections produced in 2017, based on updated emission factors, now show predicted areas of non-compliance in Wales in 2020 and beyond, unless further measures are taken.

[29] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/633270/air-quality-plan-detail.pdf

Objective

5. Tackling poor air quality in all its forms is a priority for government. The UK currently meets its international commitments for overall emissions of all air pollutants. The only statutory air quality limit that Wales, and the rest of the UK, is currently failing to meet is on NO_2 concentrations.

6. The focus of this plan is on the Welsh Government's most immediate air quality challenge. This is to reduce concentrations of NO_2 around roads in Wales where levels are above legal limits within the shortest possible time, in a way that achieves limit values as quickly as possible and by taking steps which mean meeting the limit values is not just possible but likely. The objective of the Welsh Government, the UK Government, and the other devolved administrations is to transform the UK's most polluted towns and cities into clean and healthy urban spaces, supporting those most directly affected and ensuring that vehicle manufacturers play their part to improve the nation's air quality.

Roles and Responsibilities

7. At the domestic level, responsibility for implementing the Directive is a devolved matter, and the Welsh Ministers are the competent authority in respect of Wales. The Directive is implemented in Wales by way of the Welsh Regulations. The Welsh Government and the other UK administrations support local authorities and public transport providers via guidance and access to grant funding schemes. The roles and responsibilities of responsible authorities across the UK are described in Section 5 of the 2017 Plan [30].

8. The Welsh Government's ability to take action in relation to air quality is limited to taking steps that fall within the scope of its devolved competence. This includes the implementation of local measures where exceedances exist on the strategic road network using its powers as highway authority. Where a local authority is responsible for a relevant stretch of road, the Welsh Government has the power to direct that authority to take action. Outside this the Welsh Government engages with the UK Government on relevant matters that are not within its devolved competence, such as vehicle specification standards, vehicle excise duty, fuel duty, and the enforcement of Euro emission standards.

[30] Section 5 – the 2017 Plan – Page 11-15 - Https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/633270/air-quality-plan-detail.pdf

Locations of excess pollution in Wales

9. The Directive and the Welsh Regulations provide for an hourly and an annual limit value for NO_2:

i) an hourly limit value of an average of 200 micrograms per cubic metre(which must not be exceeded more than 18 times in a calendar year);
ii) an annual limit value of an average of 40 micrograms per cubic metre.

10. The annual limit value for NO_2 is currently exceeded in Cardiff and Caerphilly (Hafod-yr-ynys) and at five other locations on the motorway and trunk road network in Wales. The hourly limit value for NO_2 is currently achieved in all locations throughout Wales, with the exception of Hafod-yr-ynys. The overall position as to exceedances and the projections as to when limit values will be met in each zone in Wales under baseline conditions[31] is:

(1) In North Wales, the limit value is exceeded on a total of 7.7 km of road, on the A494 at Deeside and the A483 near Wrexham. The current projection is that the limit value will be met in North Wales in 2021.

(2) In South Wales, the limit value is exceeded on a total of 15.1 km of road, on the A48 near Cardiff, on the A472 near Hafod-yr-ynys, on the M4 between junctions 41 and 42 (Port Talbot) and between junctions 25 and 26 (Newport), and on the A470 between Upper Boat and Pontypridd (there are additional short stretches of road which are the responsibility of Cardiff City Council but, owing to the location of the zone boundaries, fall within the South Wales zone rather than the Cardiff Urban Area). The current projection is that the limit value will be met in South Wales in 2026. However, as explained below, this projected date is the result of apparently anomalous data produced by a monitoring station at Hafod-yr-ynys, which is currently being investigated.

(3) In Cardiff Urban Area, the limit value is exceeded on a total of 16.3 km of road, on the A4161, the A4232, the A4234, the A470 and the A48. The A48, which extends out of the Cardiff Urban Area agglomeration zone and into the South Wales non-agglomeration zone, is not projected to achieve compliance until 2023 without further measures. However, the current projection is that the limit value will be met in the Cardiff urban area agglomeration zone itself in 2021.

[31] "Baseline conditions" refers to the situation where only those EU, regional and local measures currently planned are implemented, i.e. additional measures are such as those referred to below are not implemented. The modelled projections for each year from 2017 to 2030, using 2015 as the reference year, indicate when compliance with the NO_2 limit values is likely to be achieved under baseline conditions. Details of the methods used for the baseline emissions and projections modelling are provided in the UK technical report. https://www.gov.uk/government/publications/air-quality-plan-for-nitrogen-dioxide-no2-in-uk-2017

(4) In Swansea Urban Area, the limit value is exceeded on a total of 2.7 km of road, on the M4 between junctions 41 and 42 (Port Talbot). The current projection is that the limit value will be met in Swansea in 2020.

11. Maps showing each exceedance situation are included at **Annex B**.

Actions to reduce NO_2 concentrations to within legal limits in Wales

Local solutions on Local Authority managed roads

12. The stretches of road exceeding NO_2 limit values for which local authorities are responsible are described in Annex B. They are a single stretch of road on the A472 at Hafod-yr-ynys for which Caerphilly County Borough Council is responsible, and the A4161, the A4232, the A4234, the A470 and the A48, for which Cardiff City Council is responsible.

13. Local knowledge is vital to finding air quality solutions that are suited to local areas and the communities and businesses affected. Local characteristics can affect local levels of pollution and national modelling will not pick up all of the necessary local detail. The size of the exceedance can also vary according to local circumstances. A leading role for local authorities responsible for roads which are non-compliant is essential.

14. Annex F sets out the modelling techniques and assumptions that Caerphilly County Borough Council and Cardiff Council should adopt when identifying their local solutions in accordance with the provisions set out below.

Implementing measures at Cardiff

15. The Technical Report[32] published alongside the 2017 Plan identified Clean Air Zones that include charging access restrictions, as the measure Government was able to model nationally which will achieve statutory NO_2 limit values in towns and cities in the shortest possible time (potentially reducing NO_2 concentrations by up to 11.0µg/m^3 [33]). The assumptions in the Technical Report were quantified and supplied by Defra. The assessment in that report indicated that Cardiff was one area where non-compliance might be resolved by implementing a charging Clean Air Zone.

16. A Clean Air Zone is an area where targeted action is taken to improve air quality. This may include the need to restrict the access of the most polluting vehicles from the areas, through either banning or charging for access. Clean Air Zones aim to reduce all types of air pollution, including nitrogen dioxide and particulate matter, so that people breathe in less of all these pollutants. Clean Air Zones are area specific and so what works in one city or place may not necessarily have the same impact elsewhere. There are currently no Clean Air Zones in Wales.

[32] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/632916/air-quality-plan-technical-report.pdf
[33] Table 3.8, Draft Technical Report, May 2017 https://consult.defra.gov.uk/airquality/air-quality-plan-for-tackling-nitrogen-dioxide/supporting_documents/Technical%20Report%20%20Amended%209%20May%202017.pdf

17. On 9 March 2018, the Welsh Ministers issued a Direction to Cardiff Council to undertake a local feasibility assessment to identify the best option for achieving the statutory NO_2 limit values within the shortest possible time.

18. The Ministerial Direction set clear deadlines for the delivery of a plan and full business case setting out the preferred option for delivering compliance with NO_2 limit values in the shortest possible time in the areas for which Cardiff Council is responsible.

19. The timetable for implementation is as follows:

	2018				2019			
Action	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**
Cardiff Council must provide to the Welsh Ministers scoping proposals for their feasibility study as soon as possible and by 31 March at the latest.	Cardiff Council proposal to the Welsh Government. **Completed.**							
Transport and air quality data collection.								
Local modelling to inform the assessment of options to accelerate compliance. Local modelling assessments will include transport (e.g. vehicle flows and fleet compositions) and air quality dispersion modelling of the local situation.			May to December 2018					
Options will be examined and evaluated by local authorities as the findings of the assessments and local consultation become available.			July 2018 to March 2019					
Initial plans will be drawn up and submitted to the Welsh Ministers.			As soon as possible and by the end of September 2018 at the latest.					
Local consultation, held during the final stages of the assessment period, will be completed by the local authorities.					By the end of March 2019.			
Final plans (i.e. a feasibility study) and full business case including implementation arrangements will be drawn up and finalised by the local authorities and submitted to the Welsh Ministers.						As soon as possible and by the end of June 2019 at the latest.		
Welsh Ministers will consider and sign off of the plans following advice received from a full and independent assessment.							As soon as possible and by the end of July 2019 at the latest.	

20. Examples of data collection can include traffic surveys of all vehicle types across the study area, estimates of likely behavioural responses to measures, local meteorological data, terrain data and air quality data. Data should be representative of the range of conditions expected over long term annual periods to ensure local assessments are robust. Timings will depend on the availability and quality of existing data and the complexity of the local situation.

21. Remedial options will need to be scoped and developed, informed by local engagement, prior to commencing assessments. The local modelling will need to assess a range of scenarios and be based on robust and representative data, including the data referred to above. Timings will depend on the availability of robust datasets and the complexity of the local situation and of the measures proposed.

22. Options will be assessed and evaluated as soon as information becomes available, in parallel with the local assessments and consultation..

23. The initial plans should set out the case for change and identify options to accelerate compliance, including indicative costs.

24. Sufficient time should be provided for all stakeholders to consider the local proposals and respond within local consultations.

25. Final plans and a full business case must be submitted to the Welsh Ministers by the end of June 2019 at the latest. These plans could take up to 3 months, following local consultation, to develop and sign-off prior to submission to the Welsh Ministers.

26. The Welsh Government will convene an expert panel to undertake an independent assessment of the interim and final plans which will advise Welsh Ministers and ensure measures in the plans deliver compliance in the soonest time.

27. Following consideration and approval of the plans, Welsh Ministers will use their power to give directions to impose legal duties on Cardiff Council to implement the measures in the plans which deliver compliance in the soonest possible time. Implementation of the plans will depend on the nature of the measures identified. Significant measures could require a period of infrastructure procurement and installation, for example signs, traffic management systems and cameras. This would be expected to take up to six months. A period of systems testing and local engagement may also be likely to take up to six months to enable businesses and individuals to adjust.

~~28.~~ The Welsh Government expects implementation of Clean Air Zones could take up to three years from the start of the assessment process (i.e. by the end of 2020), achieving

compliance in 2021. Unless Cardiff Council identifies an alternative measure or measures which would bring the roads for which they are responsible (in the Cardiff Urban Area and South Wales zone) into compliance at least as quickly as a charging CAZ, Cardiff Council will be required by direction to introduce a charging CAZ.

Implementing measures at Hafod-yr-ynys

29. On 9 March 2018, the Welsh Ministers issued a Direction to Caerphilly County Borough Council to undertake a local feasibility assessment to identify the best option to achieve the statutory NO_2 limit values within the shortest possible time.

30. The Ministerial Direction set clear deadlines for the delivery of a plan and full business case setting out the preferred option for delivering compliance with NO_2 limit values in the shortest possible time in the areas for which Caerphilly County Borough Council and are responsible.

31. The timetable for implementation is as follows:

	2018				2019			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Caerphilly County Borough Council must provide to the Welsh Ministers scoping proposals for their feasibility study.	Caerphilly Council proposal to the Welsh Government. **Completed.**							
Transport and air quality data collection.								
Local modelling to inform the assessment of options to accelerate compliance. Local modelling assessments will include transport (e.g. vehicle flows and fleet compositions) and air quality dispersion modelling of the local situation.			May to December 2018					
Options will be examined and evaluated by local authorities as the findings of the assessments and local consultation become available.					July to March 2019			
Initial plans will be drawn up and submitted to the Welsh Ministers.			As soon as possible and by the end of September 2018 at the latest.					
Local consultation, held during the final stages of the assessment period, will be completed by the local authorities.					By the end of March 2019.			
Final plans (i.e. a feasibility study) and full business case including implementation arrangements will be drawn up and finalised by the local authorities and submitted to the Welsh Ministers.						As soon as possible and by the end of June 2019 at the latest.		
Welsh Ministers will consider and sign off of the plans following advice received from a full and independent assessment.							As soon as possible and by the end of July 2019 at the latest.	

32. Examples of data required to be collected may include traffic surveys of all vehicle types across the study area, estimates of likely behavioural responses to measures, local meteorological data, terrain data and air quality data. Data should be representative of the range of conditions expected over long term annual periods to ensure local assessments are robust. Timings will depend on the availability and quality of existing data and the local situation.

33. Remedial options will need to be scoped and developed, informed by local engagement, prior to commencing assessments. The local modelling will need to assess a range of scenarios and be based on robust and representative data, including the data referred to above. Timings will depend on the availability of robust datasets and the complexity of the local situation and of the measures proposed.

34. Options will be assessed and evaluated as soon as information becomes available, in parallel with the local assessments and consultation.

35. The initial plans should set out the case for change and identify options to accelerate compliance, including indicative costs.

36. Sufficient time should be provided for all stakeholders to consider the local proposals and respond within local consultations.

37. Final plans and a full business case must be submitted to the Welsh Ministers by the end of June 2019 at the latest. These plans could take up to 3 months, following local consultation, to develop and sign-off prior to submission to the Welsh Ministers. An expert panel will be convened to undertake an independent assessment of the interim and final plans and to advise Welsh Ministers to ensure that the measures in the plans deliver compliance in the soonest time. Following consideration and approval of the plans, the Welsh Ministers will require (by direction) Caerphilly County Borough Council to implement the measure or measures in the plans which deliver compliance in the soonest possible time.

38. The Welsh Government recognises that a Clean Air Zone may not be appropriate for the purposes of accelerating compliance in all cases, for example, outside of urban areas where no alternative routes are available. In such situations, of which Hafod-yr-ynys is one, alternative measures may be required. The maximum time required to reach compliance in this area is currently uncertain and will be determined following Caerphilly County Borough Council's feasibility study.The Welsh Government expects that the local authority will begin to implement the most effective measures identified in the study (including potential infrastructure measures) by October 2019 and that they will be

completed as soon as possible, and by the end of December 2020 at the latest, to achieve compliance by 2021 and sooner if possible.

Review of monitor siting on A472, Hafod-yr-ynys

39. Following recent concerns that the measured levels at this location are highly likely to be influenced by the unusual siting of the monitoring station, the Welsh Government commissioned an independent, expert, review of the siting. The review concluded that the siting of the monitor at Hafod-yr-ynys does not fully satisfy the requirements of the Directive. The Welsh Government is working with Defra to identify and install an alternative monitoring site as a matter of urgency. We expect this Programme of work to complete by summer 2018, if not sooner (although the current monitor is likely to remain in place to inform the local authority about levels of pollution under their local air quality management responsibilities). Proposals to address non-compliance will need to account for the information from the alternative monitoring site to ensure they are effective and proportionate.

Welsh Government support for Cardiff and Caerphilly County Borough Councils

40. The Welsh Government has allocated over £20 million for an Air Quality Fund through to 2021 to help accelerate compliance with NO2 limits and improve air quality in Wales.

41. This fund will be used to provide ongoing support, guidance and finance to enable Councils to develop and implement plans and take action to achieve compliance in the soonest possible time.

Local solutions on Welsh Government managed network roads

42. The Welsh Government has direct responsibility for exceedances on the following discrete stretches of motorway and trunk road outside the Cardiff and Swansea urban area:

(i) A494 at Deeside; (North Wales Zone);
(ii) A483 near Wrexham; (North Wales Zone);
(iii) M4 between junctions 41 and 42 (Port Talbot);(Swansea and South Wales Zone);
(iv) M4 between junctions 25 and 26 (Newport); (South Wales Zone); and
(v) A470 between Upper Boat and Pontypridd. (South Wales Zone).

43. Baseline PCM predicted NO_2 concentrations without NO_2 reduction network measures (taken from the 2017 Plan, July 2017) are provided in the table below.

Stretch of Road	**Site Location**	**NO_2 Predicted Baseline Concentrations (µg/m^3)**						
		2015	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**
A494 Deeside	Aston Hill	-	**50**	**48**	**46**	**43**	**40**	38
	Jnc A550 – Jnc A548	-	**48**	**46**	**44**	**42**	39	37
	Jnc A458 Shotwick Rd	-	**42**	**40**	38	36	34	32
A483 Wrexham	Wrexham	-	**41**	39	38	36	33	31
M4 Jnc 41-42	Jnc 41-42	**47**	**45**	**43**	**41**	39	37	-
M4 Jnc 25-26	West of River Usk	**51**	**48**	**46**	**44**	**42**	39	-
	East of River Usk	**43**	**41**	39	37	35	33	-
A470	Pontypridd	**50**	**48**	**46**	**44**	**42**	39	-
	Upper Boat	**44**	**42**	**40**	39	37	34	-

44. The table shows that without the implementation of any measures, compliance is predicted for the A483 at Wrexham this year. However the M4 between junctions 25 and 26 and junctions 41 and 42 and the A470 between Pontypridd and Upper Boat will not achieve compliance until until 2021 and the A494 will not achieve compliance until 2022.

Identification and Analysis of Potential Measures

45. The identification and analysis of potential measures for improving air quality at each stretch of the strategic road network where an exceedance exists is being carried out using the Welsh Transport Appraisal Guidance (WelTAG).

46. WelTAG provides a robust framework [34] for identifying and appraising the likely effectiveness of proposed measures in delivering specific objectives. In this case the focus is on air quality and the objective set is to identify measures which will assist in bringing forward reductions in NO_2 in the shortest possible time at each location. That objective is assessed against three key criteria:

- Effectiveness – is the intervention likely to reduce roadside concentrations to below the 40 micrograms per cubic metre legal limit;
- Timescales – can the intervention be implemented within timescales that are meaningful (short enough) to have an impact on bringing forward the projected compliance date; and
- Feasibility/Deliverability – can the intervention be delivered in the location involved with the powers available to the Welsh Government as Highway Authority.

47. WelTAG studies are taken forward in stages of increasing detail as potentially effective measures move through identification, comparison and selection. The outcome is a set of measures or packages of measures that are most likely to be effective in achieving compliance in the shortest possible time at a particular location.

48. WelTAG Stage 1 (Strategic Outline Case) identifies a long list of viable measures and, depending on their fit with the objective, is used to select a short list for further consideration. Following further investigation, WelTAG Stage 2 (Outline Business Case) is used to select on the basis of their performance against the objective preferred measures to be taken forward. WelTAG Stage 3 (Full Business Case) is used to make a full and detailed assessment of preferred measures to inform a final decision on their implementation and includes traffic modelling and an air quality assessment using an appropriate air quality model, including analysis of the origin of the air quality problems and an estimate of the area and population affected. Additionally, qualitative assessments of economic effects and environmental implications of measures are carried out to ensure that any unintended consequences can be identified and (where possible) addressed, but not used to override the principal objective.

33 https://beta.gov.wales/welsh-transport-appraisal-guidance-weltag

Monitoring

49. Local monitoring to provide a more in depth knowledge of the level and nature of exceedance at each of the five locations commenced in December 2017. This is being used to set a baseline against which measures are assessed. Monitoring will continue during the implementation of measures in order to assess their effectiveness and inform future studies. The monitoring is based on diffusion tubes at six locations at the side of each length of road, plus one set located for background. At Wrexham and Newport a further set is located on existing AURN or AURN equivalent. Where available, local authority results are also being used to better understand the situation. Where there are differences between the diffusion tube results and modelled exceedances, independent advice will be obtained. During WeLTAG Stage 3 consideration will be given to installing automatic monitors at each location to provide even more robust information.

Progress To Date

50. Once PCM modelling data received in June 2017 indicated that compliance at each of the five sites would not be achieved as early as originally envisaged, to bring forward compliance in the shortest possible time a "long list" was initially developed including all possible measures which might reduce the exceedance at an earlier date over the course of summer/ autumn 2017. The list of measures was taken from the following sources (which were identified as being the most relevant practice in the UK at the time):

    (i) Defra/ Ricardo 'Evidence review on the effectiveness of transport measures in reducing nitrogen dioxide' May 2016;
    (ii) Local air quality and noise management in Wales' consultation responses March 2017
    (iii) Measures from the 2015 zone plans for Cardiff, Swansea, South Wales and North Wales; and
    (iv) Scottish Government, 'Cleaner Air for Scotland' (November 2015)

    This "long list" was then used to inform the WelTAG process.

51. The WelTAG process which commenced in October 2017 is being taken forward in the shortest possible timescale. The whole process will be completed within 11 months. This timescale is determined by the time it takes to appraise the large number of potentially effective measures which requires specialist technical resource and increasingly more

complex modelling. Further details of the activities required to complete each WelTAG stage and their associated timescales are provided in the timetables below.

52. To date WelTAG Stages 1 and 2 have been completed for all 5 stretches of the motorway and trunk road network where exceedences currently exist. The WelTAG Stage 1 & 2 reports have been published alongside this consultation. For each stretch all potential measures for improving air quality have been appraised and a list of those with the potential to achieve compliance in the shortest possible time at each specific location identified. Because of the large number of measures considered, appraisal of their impact on air quality at WelTAG Stage 2 has been undertaken using professional judgement and where possible, initial emissions and dispersion modelling. Accordingly, the figures for estimated reduction in emissions and roadside concentrations in the tables below indicate the possible rather than likely effect on air quality at each specific location: the use of professional judgement and initial modelling alone is not capable of producing projections in which there is sufficient confidence to treat them as *likely* outcomes.

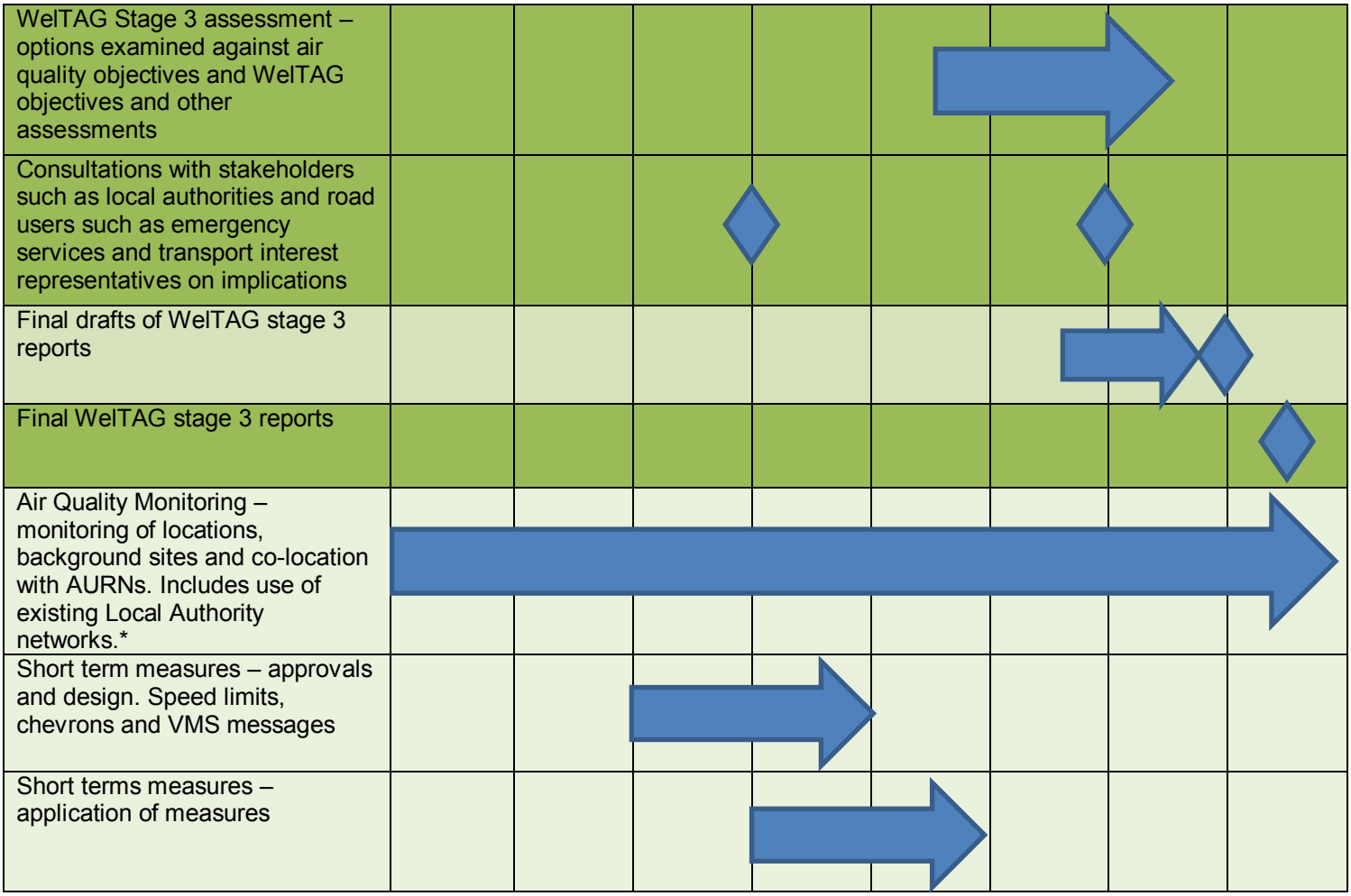
The timetable below shows all the activities and their timescales completed as part of WelTAG Stages 1 and 2 for each stretch of road:

	2017				2018	
Action	**Sept**	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**
Procurement and appointment of WelTAG stage 1 and 2 consultants						
Transport and air quality data collection. Includes Traffic Master monitoring.						
Initial air quality dispersion modelling.						
WG Long list of c400 measures examined against air quality objectives						
Sifted measures examined against air quality objectives - Stage 1						
Recommended measures examined against air quality objectives and WelTAG objectives – Stage 2 – identification of measures to take forward to Stage 3						
Effectiveness Review of potential measures carried out from existing published sources.						
Final draft reports prepared						
Final reports agreed						
Air Quality Monitoring – appointment of consultants						
Air Quality Monitoring – monitoring of locations, background sites and co-location with AURNs. Use of results from Local Authority Networks.						

53. The likely effect of each measure on air quality will be determined through detailed modelling undertaken as part of WelTAG Stage 3 studies and monitoring. WelTAG Stage 3 assessments will include traffic modelling using microsimulation and associated strategic traffic models and air quality assessment using the Defra emission factor toolkit and an appropriate air quality dispersion model for testing the earliest achievable compliance date for the limit value for annual mean NO_2. WelTAG Stage 3 studies are currently underway and will be completed by the end of August 2018. The studies will be published upon completion.

The timetable below shows all the activities and their timescales which it's intended to complete as part of WelTAG Stage 3 for each stretch of road:

	2018							
Action	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**
Procurement and appointment of WelTAG Stage 3 consultants								
Transport and air quality data update and collection. Includes ANPR information where available.								
Review of Stage 2 work including drawing up of initial engineering proposals to inform Stage 3 of measures being taken forward								
Traffic Modelling (e.g. vehicle flows, speeds and fleet compositions) using micro-simulation; informed and validated by other existing and regional and local models.								
Detailed Air Quality Emissions/Dispersal Modelling of NO2 levels using ADMS and latest DEFRA/DfT emissions factor toolkit, informed by results of ongoing air quality monitoring and monitoring of short term measures								
Value for money, Health Impact Assessments and other assessments prepared.								



Implementation of Measures

54. The Welsh Government is committed to delivering improvement in air quality for its citizens as soon as possible. Therefore measures identified during the course of WelTAG Stage 2, which are relatively quick to deploy on the strategic road network using highway authority powers and with the possibility of bringing the largest immediate improvement to air quality (based on WelTAG Stage 2 estimates of their *possible* impact on air quality) and hence potentially accelerate compliance at each of the 5 locations will be implemented by the end of June 2018. Specific details of these measures for each of the 5 locations are provided below:

A494 at Deeside (North Wales Zone)

Reduced 50 mph speed limit (current speed limit 70 mph) over the length of the exceedance combined with messages on signs informing drivers of the reason for the new speed limit and encouraging smooth traffic flows.

A483 at Wrexham (North Wales Zone)

Reduced 50 mph speed limit (current speed limit 70 mph) over the length of the exceedance combined with messages on signs informing drivers of the reason for the new speed limit and encouraging smooth traffic flows.

M4 between Junctions 41 & 42 (Port Talbot) (Swansea & South Wales)

Reduced 50 mph speed limit (current speed limit 70 mph) over the length of the exceedance combined with messages on signs informing drivers of the reason for the new speed limit and encouraging smooth traffic flows.

M4 between junctions 25 & 26 (Newport) (South Wales Zone)

Reduced 50 mph speed limit (current speed limit 70 mph) using existing variable speed limit infrastructure over the length of the exceedance combined with messages on signs informing drivers of the reason for the new speed limit and encouraging smooth traffic flows.

A470 between Upper Boat & Pontypridd (South Wales Zone)

Reduced 50 mph speed limit (current speed limit 70 mph) over the length of the exceedance and chevron road markings to maintain vehicle spacing combined with messages on signs informing drivers of the reason for the new speed limit and encouraging smooth traffic flows.

55. Based on the predicted concentrations of NO2 in the table above and current estimates of the *possible* impact of these measures on air quality from WelTAG Stage 2 (see the following tables), it is *possible* that A483 Wrexham, M4 junctions 41 & 42 and A470 Upperboat to Pontypridd will achieve compliance in 2018, A494 Deeside in 2019 and M4 junctions 25 & 26 in 2020 with these measures alone.

56. These “short term” measures will continue be appraised alongside “longer term” measures as part of WelTAG Stage 3 at each of the 5 locations. “Longer term” measures are those that cannot be implemented before the end of the WelTAG study when their *likely* impact on air quality will e known. The outcome of WelTAG Stage 3 at the end of August 2018 will identify any measures or any package of measures that are likely to ensure compliance at each of the 5 locations as soon as possible. This may be the continuation of “short term” measures, or a combination of “short term” and “longer term measures”. It is possible that at some locations no measures will be identified that are likely to accelerate compliance, particularly at sites that are predicted to be compliant later this year under baseline conditions. The WelTAG Stage 3 report will be published in September 2018.The Welsh Ministers commit to implement as quickly as possible. Any measure or combination of measures identified at WelTAG Stage 3 as being likely to achieve compliance with the limit values within the shortest possible time at each of the

five locations, commencing in Autumn 2018 and completing by Autumn 2019. The exception to this are wider measures such as clean air/ low emission zones which, if required, will have to be implemented over longer timescales due to the statutory processes involved and are unlikely to be in place in less than 3 years.

57. The tables below provide details of the measures that will be subject to further detailed appraisal as part of WelTAG Stage 3 at each of the 5 locations and their possible impact on air quality following completion of WelTAG Stage 1 and 2 Studies. The likely impact of these measures and the measure or package of measures likely to achieve compliance at the earliest possible date will be established in WelTAG Stage 3 following detailed modelling.

(i) A494 at Deeside (North Wales Zone)

Measure	Estimated Possible Reduction in Emissions (up to %)[35]	Estimated Possible Reduction in Roadside Concentrations (up to µg/m^3)[36]	Implementation
Reduced 50mph Speed Limit	17.0	6.9	By end June 2018
Variable Message Signs to Inform/ Influence Drivers	1.0	-	By end June 2018
Static Signs to Inform/ Influence Drivers	1.0	-	By end June 2018
Wider Behaviour Change Measures (e.g. Active Travel, Personal Travel Plans etc.)	1.0	0.4	Subject to outcome of WelTAG Stage 3
Intelligent Traffic Management (Using Real Time Emissions to Smooth/ Divert Traffic Flows)	2.0	-	Subject to outcome of WelTAG Stage 3
Fencing/ Screening	0	4.5	Subject to outcome of WelTAG Stage 3
Upstream Traffic Flow Management	2.0	0.8	Subject to outcome of WelTAG Stage 3
Ramp Metering (Controlling Traffic Flows from Junctions)	0.5	0.6	Subject to outcome of WelTAG Stage 3

[35] In this table and the following tables, the possible reduction in emissions and roadside concentrations was estimated at WelTAG Stage 2 using a combination of professional judgement and, where possible, initial emission and dispersion modelling. It should be noted that there is not necessarily a direct relationship between reduction in emissions and roadside concentrations, as the latter are location-dependent, and therefore figures for roadside concentrations can vary despite the percentage reduction in emissions being the same. Further, the provision of air quality fencing or screening does not reduce emissions, but can reduce concentrations.

[36] In this table and the tables that follow, no estimates for the possible reduction in roadside concentrations are provided for variable message signs, static signs or intelligent traffic management because, unlike possible reductions in emissions, these were not modelled in WelTAG Stage 2.

Variable Diversions	2.0	0.8	Subject to outcome of WelTAG Stage 3
Clean Air/ Low Emission Zone	5.0	2.2	Subject to outcome of WelTAG Stage 3

(ii) A483 near Wrexham (North Wales Zone)

Measure	**Estimated Possible Reduction in Emissions (up to %)**	**Estimated Possible Reduction in Roadside Concentrations (up to µg/m^3)**	**Implementation**
Reduced 50mph Speed Limit	18.0	6.9	By end June 2018
Variable Message Signs to Inform/Influence Drivers	1.0	-	By end June 2018
Static Signs to Inform/ Influence Drivers	1.0	-	By end June 2018
Wider Behaviour Change Measures (e.g. Active Travel, Personal Travel Plans etc.)	1.0	0.4	Subject to outcome of WelTAG Stage 3
Intelligent Traffic Management (Using Real Time Emissions to Smooth/ Divert Traffic Flows)	2.0	-	Subject to outcome of WelTAG Stage 3
Fencing/ Screening	0	3.9	Subject to outcome of WelTAG Stage 3
Upstream Traffic Flow Management	1.0	0.4	Subject to outcome of WelTAG Stage 3
Junction Closures	1.0	0.3	Subject to outcome of WelTAG Stage 3
Variable Diversions	3.0	1.0	Subject to outcome of WelTAG Stage 3
Clean Air/ Low Emission Zone	4.0	1.5	Subject to outcome of WelTAG Stage 3

(iii)M4 between junctions 41 & 42 (Port Talbot) (Swansea & South Wales)

Measure	**Estimated Possible Reduction in Emissions (up to %)**	**Estimated Possible Reduction in Roadside Concentrations (up to µg/m^3)**	**Implementation**
Reduced 50mph Speed Limit	8.0	3.5	By end June 2018
Wider Behaviour Change Measures (e.g. Active Travel, Personal Travel Plans etc.)	2.0	0.5	Subject to outcome of WelTAG Stage 3

Ramp Metering (Controlling Traffic Flows from Junctions)	1.0	0.4	Subject to outcome of WelTAG Stage 3
Junction Closures	3.0	0.4	Subject to outcome of WelTAG Stage 3
Variable Diversions	3.0	0.8	Subject to outcome of WelTAG Stage 3
Clean Air/ Low Emission Zone	3.0	1.0	Subject to outcome of WelTAG Stage 3

(iv) M4 between junctions 25 & 26 (Newport) (South Wales Zone)

Measure	**Estimated Possible Reduction in Emissions (up to %)[1]**	**Estimated Possible Reduction in Roadside Concentrations (up to µg/m^3)[1]**	**Implementation**
Reduced 50mph Speed Limit overnight using existing Variable Speed Infrastructure	4.0	3.8	By end June 2018
Wider Behaviour Change Measures (e.g. Active Travel, Personal Travel Plans etc.)	3.0	1.2	Subject to outcome of WelTAG Stage 3
Intelligent Traffic Management (Using Real Time Emissions to Smooth/ Divert Traffic Flows)	5.0	-	Subject to outcome of WelTAG Stage 3
Junction Closures	2.0	0.6	Subject to outcome of WelTAG Stage 3
Variable Diversions	5.0	2.0	Subject to outcome of WelTAG Stage 3
Clean Air/ Low Emission Zone	5.0	2.0	Subject to outcome of WelTAG Stage 3

(v) A470 between Upper Boat & Pontypridd (South Wales Zone)

Measure	**Estimated Possible Reduction in Emissions (up to %)[1]**	**Estimated Possible Reduction in Roadside Reduction (up to µg/m^3)[1]**	**Implementation**
Reduced 50mph Speed Limit	11.0	12.0	By end June 2018
Variable Message Signs to Inform/Influence Drivers	1.0	-	By end June 2018
Static Signs to Inform/ Influence Driver Behaviour	1.0	-	By end June 2018
Distance Chevrons to Smooth Flow	0.5	0.2	By end June 2018
Wider Behaviour Change Measures (e.g. Active Travel, Personal Travel	2.0	1.0	Subject to outcome of WelTAG Stage 3

Plans etc.)			
Intelligent Traffic Management (Using Real Time Emissions to Smooth/ Divert Traffic Flows)	2.0	-	Subject to outcome of WelTAG Stage 3
Fencing/ Screening	0	9.3	Subject to outcome of WelTAG Stage 3
Upstream Traffic Flow Management	3.0	1.8	Subject to outcome of WelTAG Stage 3
Ramp Metering (Controlling Traffic Flows from Junctions)	0.3	0.2	Subject to outcome of WelTAG Stage 3
Junction Closures	2.0	1.2	Subject to outcome of WelTAG Stage 3
Variable Diversions	2.0	1.5	Subject to outcome of WelTAG Stage 3
Improve Parking Provision (Promoting use of Public Transport & Car Sharing)	2.0	1.0	Subject to outcome of WelTAG Stage 3
Car Sharing	1.0	0.4	Subject to outcome of WelTAG Stage 3
Clean Air/ Low Emission Zone	3.0	2.4	Subject to outcome of WelTAG Stage 3

Annex A – General information about each air quality zone

The climate

Information on UK climatic data is provided in the *Technical Report*[37] of the *UK Plan for tackling roadside nitrogen dioxide concentrations*. The UK lies in the latitude of predominately westerly winds where depressions and their associated bands of cloud and rain ('fronts') move eastwards or north-eastwards across the North Atlantic, bringing with them unsettled and windy weather particularly in winter. Between the depressions there are often small mobile anticyclones that bring fair weather. It is the sequence of depressions and anticyclones that is responsible for the UK's changeable weather.

The western and northern parts of the UK tend to lie close to the normal path of the Atlantic depressions. Consequently, in those parts of the UK winters tend to be mild and stormy while the summers, when the depression track is further north and the depressions less deep, are mostly cool and windy. The mountains in these regions have the effect of producing a marked increase in rainfall. The lowlands of England have a climate similar to that in continental Europe: drier with a wider range of temperatures than in the north and west. However, the winters are not as severe as those on the continent. Overall, the south of the UK is usually warmer than the north, and the west is wetter than the east. The more extreme weather tends to occur in mountainous regions where it is often cloudy, wet and windy.

Detailed UK climatic data is available on the Met Office website.

National Meteorological Library and Archive Fact sheet 4 Climate of the British Isles https://www.metoffice.gov.uk/learning/library/publications/factsheets

Topography

The mountainous regions of mid and north-Wales include the highest point 1085 metres above sea level. The population is concentrated in the lowland South which includes Cardiff and Swansea. Detailed UK population density data is available from the Office of National Statistics (https://www.ons.gov.uk/visualisations/nesscontent/dvc134_c/index.html)

[37] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/632916/air-quality-plan-technical-report.pdf

General information in relation to each zone is provided below, including the zone boundaries, population estimates and compliance status:

Cardiff Urban Area

Figure 1 shows the area covered by the Cardiff Urban Area agglomeration zone and the location of monitoring stations in the region. NO2 measurements in this zone were available in 2015 from the following national network monitoring stations (NO2 data capture for each station in 2015 shown in brackets):

Site name	Latitude, Longitude:
Cardiff Centre GB0580A (80%)	51.481780, -3.176250

Full details of monitoring stations within the South Wales non-agglomeration zone are available from http://uk-air.defra.gov.uk/networks/network-info?view=aurn.

Local authority boundaries do not necessarily coincide with zone boundaries. Hence local Authorities may be listed within more than one zone plan. The local authorities within the zone are:

- Cardiff County Council.
- Vale of Glamorgan Council.

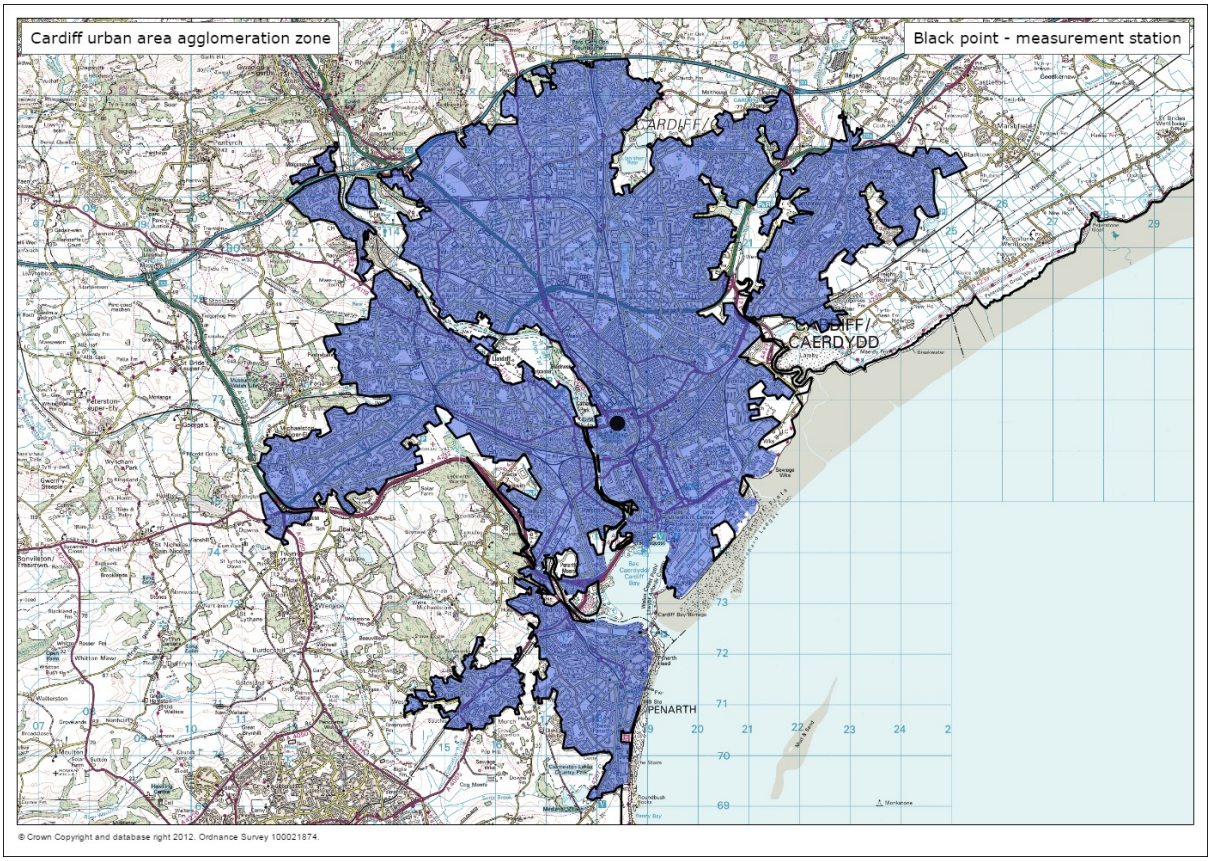


Figure 1: map of Cardiff Urban Agglomeration zone and measurement station (black dot)

The total population within the zone is approximately 327,129. Within the Cardiff Urban Area agglomeration zone the annual limit value was exceeded in 2015.

Swansea Urban Area

Figure 1 shows the area covered by the Swansea Urban Area agglomeration zone and the location of monitoring stations in the region. NO_2 measurements in this zone were available in 2015 from the following national network monitoring stations (NO2 data capture for each station in 2015 shown in brackets):

Site name	Latitude, Longitude:
Port Talbot Margam GB0906A (94%)	51.583950, -3.770822
Swansea Roadside GB0896A (99%)	51.632696, -3.947374

Full details of monitoring stations within the South Wales non-agglomeration zone are available from http://uk-air.defra.gov.uk/networks/network-info?view=aurn.

A list of local authorities within the zone is given below:

- City and County of Swansea
- Neath & Port Talbot County Borough Council

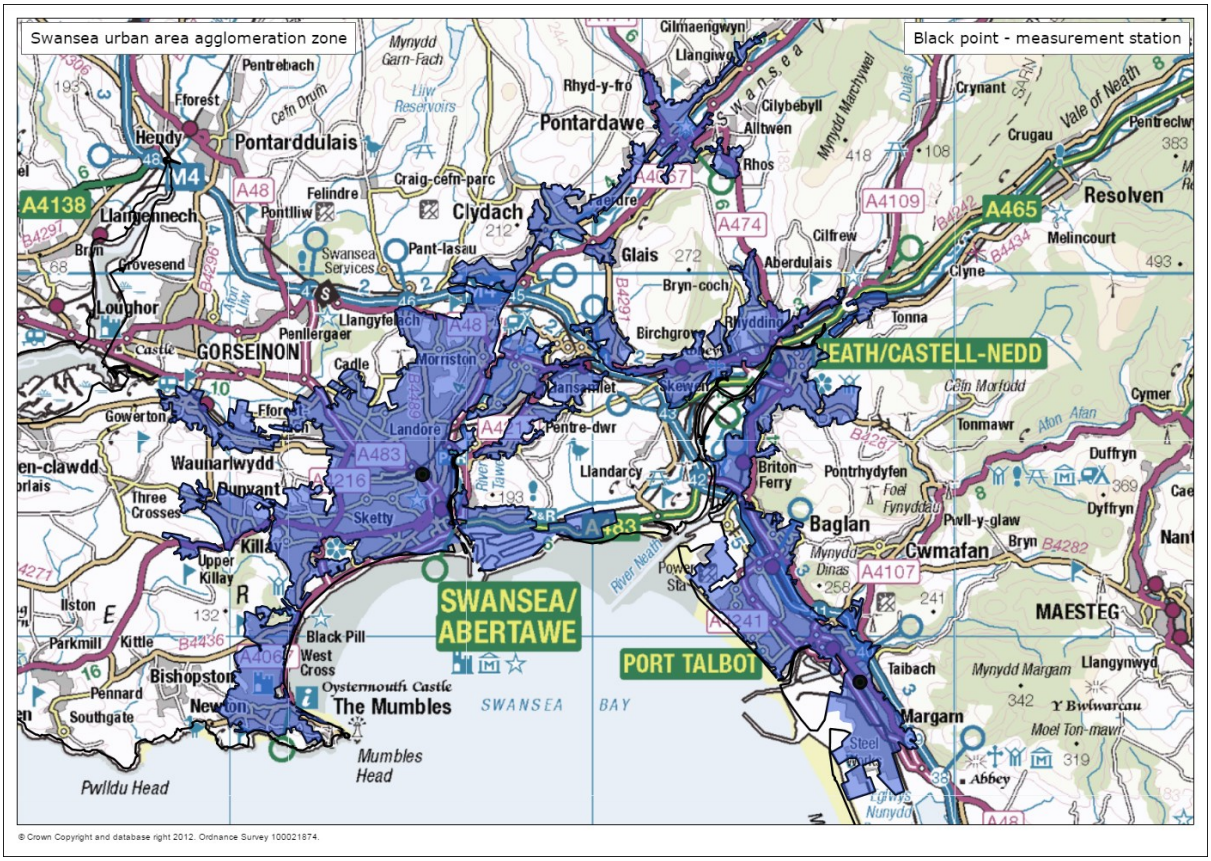


Figure 2: map of Swansea Urban Agglomeration zone and measurement stations (black dots)

The total population within the zone is approximately 210,269. Within the Swansea Urban Area agglomeration zone the annual limit value was exceeded in 2015.

South Wales non-agglomeration zone

Figure 2 shows the area covered by the South Wales non-agglomeration zone and the location of monitoring stations in the region. NO2 measurements in this zone were available in 2015 from the following national network monitoring stations (NO2 data capture for each station in 2015 shown in brackets):

Site name	Latitude, Longitude:
Chepstow A48 GB0921A (98%)	51.638094, -2.678731
Cwmbran GB0744A (99%)	51.653800, -3.006953
Narberth GB0043R (99%)	51.781784, -4.691462
Newport GB0962A (86%)	51.601203, -2.977281
Hafod-yr-ynys Roadside GB1038A (99%)	51.680579, -3.133508

Full details of monitoring stations within the South Wales non-agglomeration zone are available from http://uk-air.defra.gov.uk/networks/network-info?view=aurn.

A list of local authorities within the zone is given below.

1. Blaenau Gwent County Borough Council

2. Bridgend County Borough Council
3. Caerphilly County Borough Council
4. Cardiff County Council
5. Carmarthenshire County Council
6. Ceredigion County Council
7. City and County of Swansea
8. Merthyr Tydfil County Borough Council
9. Monmouthshire Council
10. Neath & Port Talbot County Borough Council
11. Newport City Council
12. Pembrokeshire Council
13. Powys County Council
14. Rhondda-Cynon-Taff Council
15. Torfaen County Borough Council
16. Vale of Glamorgan Council

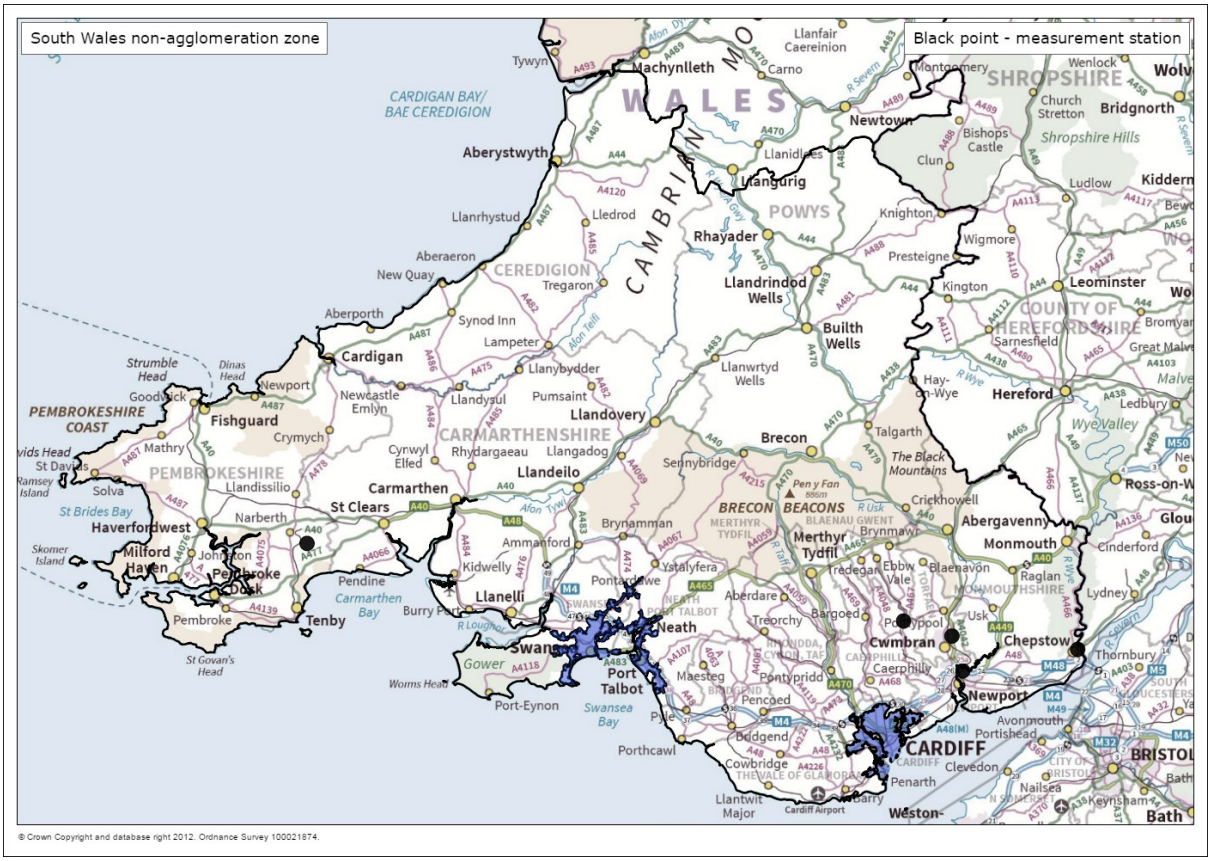


Figure 3: map of South Wales Urban Agglomeration zone and measurement stations (black dots)

This zone includes urban, industrial and rural locations. Within the South Wales non-agglomeration zone the annual limit value and the hourly limit value were exceeded in 2015.

North Wales non-agglomeration zone

Figure 3 shows the area covered by the North Wales non-agglomeration zone and the location of monitoring stations in the region. NO2 measurements in this zone were available in 2015 from the following national network monitoring stations (NO2 data capture for each station in 2015 shown in brackets):

Site name	Latitude, Longitude:
Wrexham GB0755A (99%)	53.042220, -3.002778
Aston Hill GB0031R (98%)	52.503850, -3.034178

Full details of monitoring stations within the South Wales non-agglomeration zone are available from http://uk-air.defra.gov.uk/networks/network-info?view=aurn.

A list of local authorities within the zone is given below:

- Conwy County Borough Council
- Denbighshire Council
- Flintshire County Council
- Gwynedd Council
- Isle of Anglesey County Council
- Powys County Council
- Wrexham County Borough Council

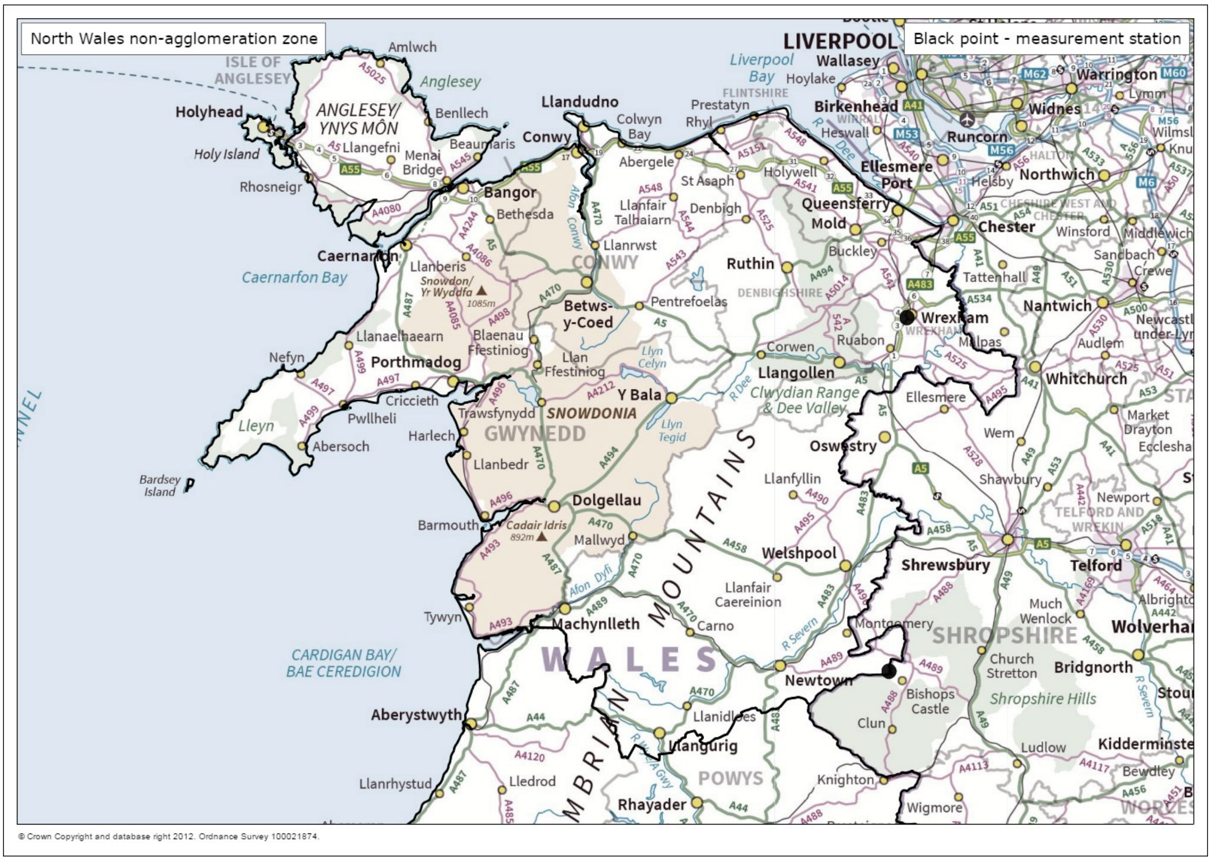


Figure 4: map of North Wales Urban Agglomeration zone and measurement stations (black dots)

This zone includes urban, industrial and rural locations. The total population within the zone is approximately 749,704. Within the North Wales non-agglomeration zone the annual limit value was exceeded in 2015.

Compliance with the annual limit value in this exceedance situation has been assessed using a combination of air quality measurements and modelling. There were no measured exceedances of the annual limit value in this zone in 2015, however, 7.7 km of road length was modelled to exceed the annual limit value. The roads which have been modelled as exceeding the annual limit value include the A494 at Deeside and the A483 near Wrexham.

The model results suggest that compliance with the NO2 annual limit value is likely to be achieved by 2021 under baseline conditions.

Annex B – Locations of roads exceeding EU NO2 limits in 2015

Cardiff Urban Area

Compliance with the annual limit value in this exceedance situation has been assessed using a combination of air quality measurements and modelling. There were no measured exceedances of the annual limit value in this zone in 2015, however, 16.3 km of road length was modelled to exceed the annual limit value. The roads which have been modelled as exceeding the annual limit value are the A4161, the A4232, the A4234, the A470 and the A48. The A48, which extends out of the Cardiff Urban Area agglomeration zone and into the South Wales non-agglomeration zone, is not projected to achieve compliance until 2023 without further measures. However, the current projection is that the limit value will be met in the Cardiff urban area agglomeration zone itself in 2021 under baseline conditions..

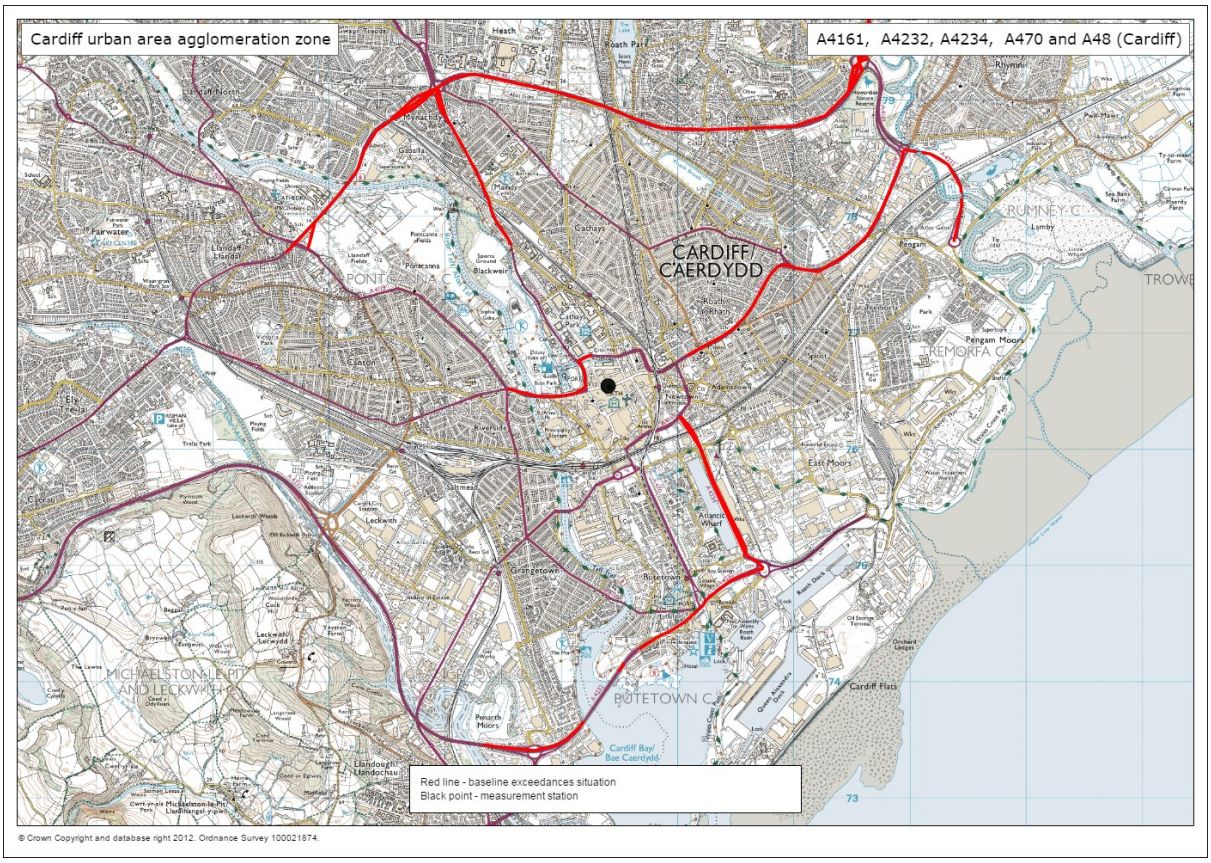


Figure 5: Exceedance situation in 2015 for Cardiff urban area aggomleration.

Swansea Urban Area

Compliance with the annual limit value in this exceedance situation has been assessed using a combination of air quality measurements and modelling. There were no measured exceedances of the annual limit value in this zone in 2015, however 2.7 km of road length on the M4 (between junctions 41 and 42 near Port Talbot) was modelled to exceed the annual limit value. Model results suggest that compliance with the NO2 annual limit value is likely to be achieved by 2020 under baseline conditions.

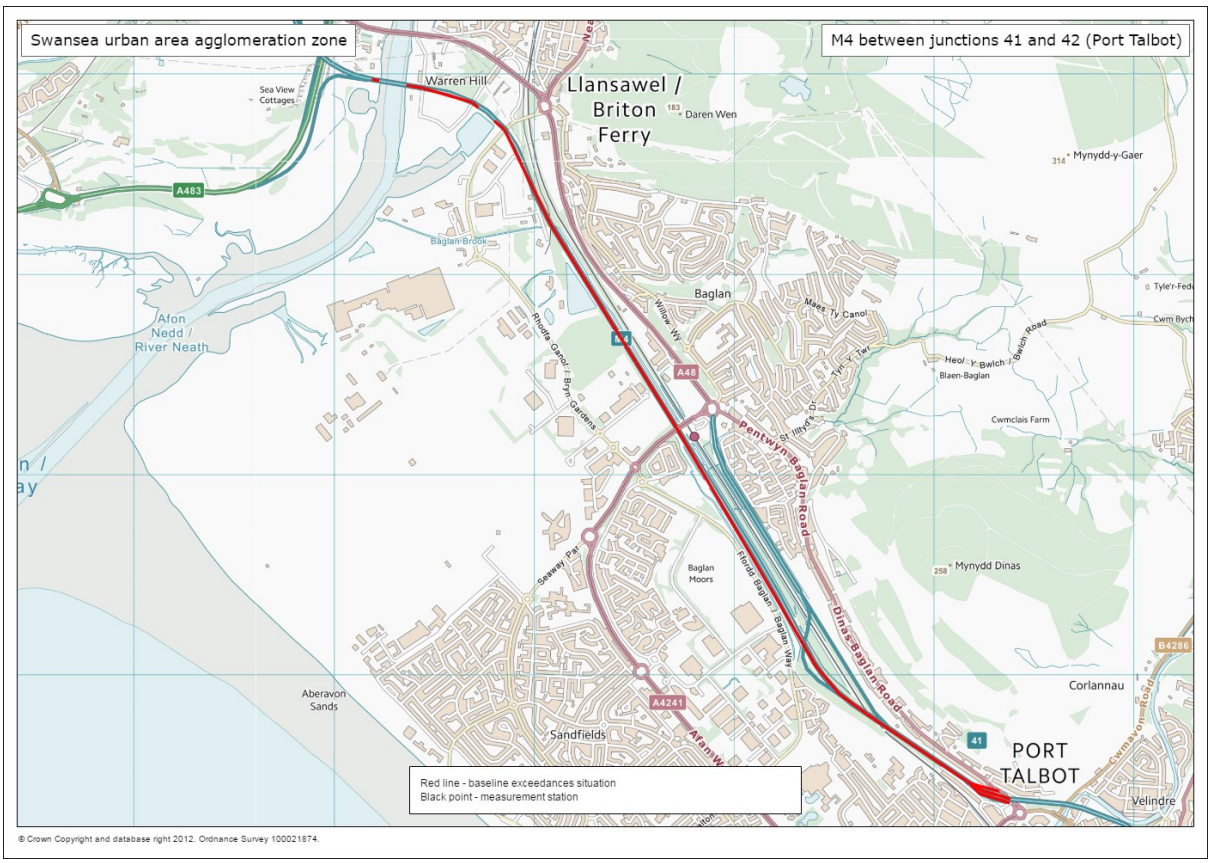


Figure 6: Exceedance situation in 2015 for Swansea urban area aggomleration.

South Wales non-agglomeration zone

The current projection is that the limit value will be met in South Wales in 2026 under baseline conditions. However, this projected date is the result of apparently anomalous data produced by a monitoring station at Hafod-yr-ynys, which is currently being investigated.

Annual limit value exceedance

In South Wales, the limit value is exceeded on a total of 15.1 km of road, on the A48 near Cardiff, on the A472 near Hafod-yr-ynys, on the M4 between junctions 41 and 42 (Port Talbot) and between junctions 25 and 26 (Newport), and on the A470 between Upper Boat and Pontypridd (there are additional short stretches of road which are the responsibility of Cardiff City Council but, owing to the location of the zone boundaries, fall within the South Wales zone rather than the Cardiff Urban Area).

In the South Wales non-agglomeration zone the measured concentration at one monitoring station, Hafod-yr-ynys Roadside (GB1038A; 68 µgm-3), exceeded the annual mean limit value in 2015 and was greater than the modelled concentration at the adjacent road link (traffic count point 78422 on the A472) of 28 µgm-3.

Hourly limit value exceedance

Compliance with the hourly limit value in this exceedance situation has been assessed using air quality measurements only. A site exceeds the hourly limit value for NO2 when NO2 concentrations exceed 200 µgm-3 for more than 18 hours per calendar year. There was a measured exceedance of the hourly limit value at Hafod-yr-ynys Roadside (GB1038A), which exceeded the limit 38 times in 2015.

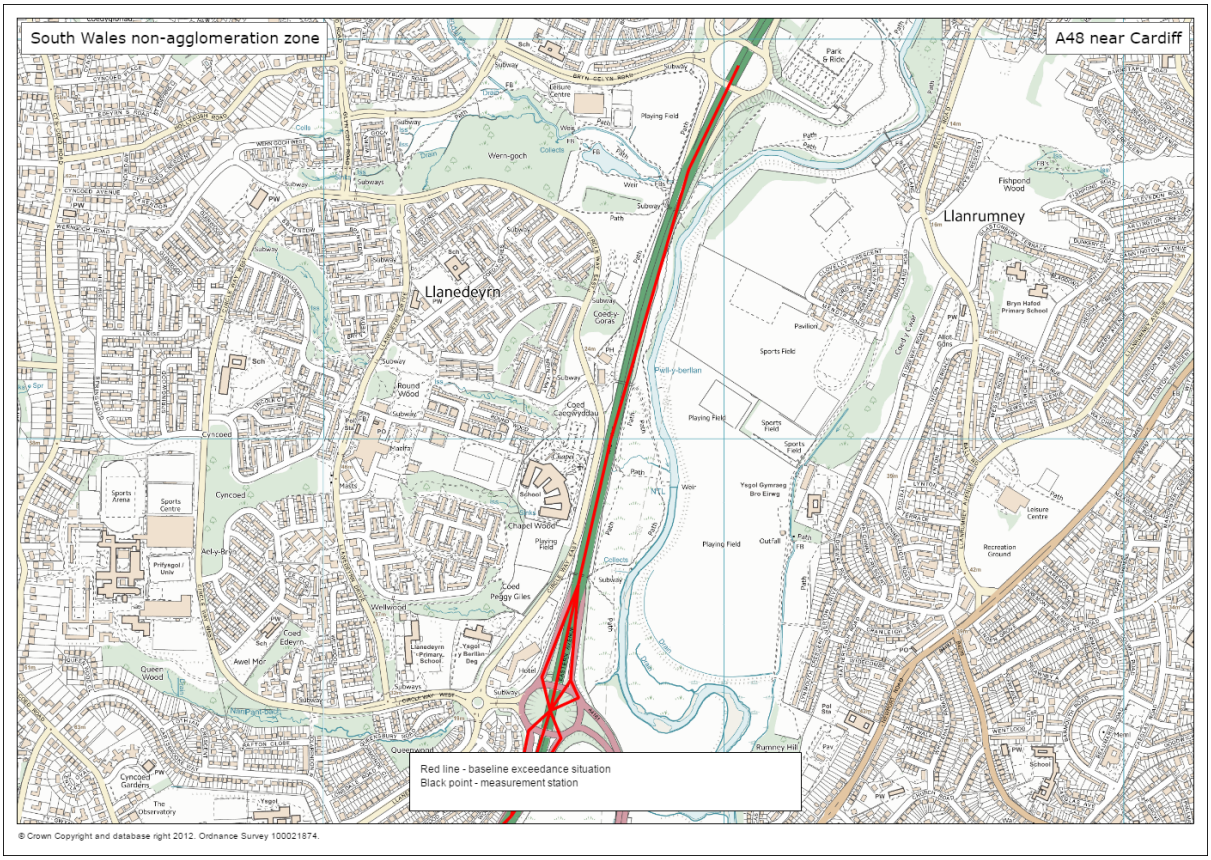


Figure 7: Exceedance situation in 2015 for A48 near Cardiff

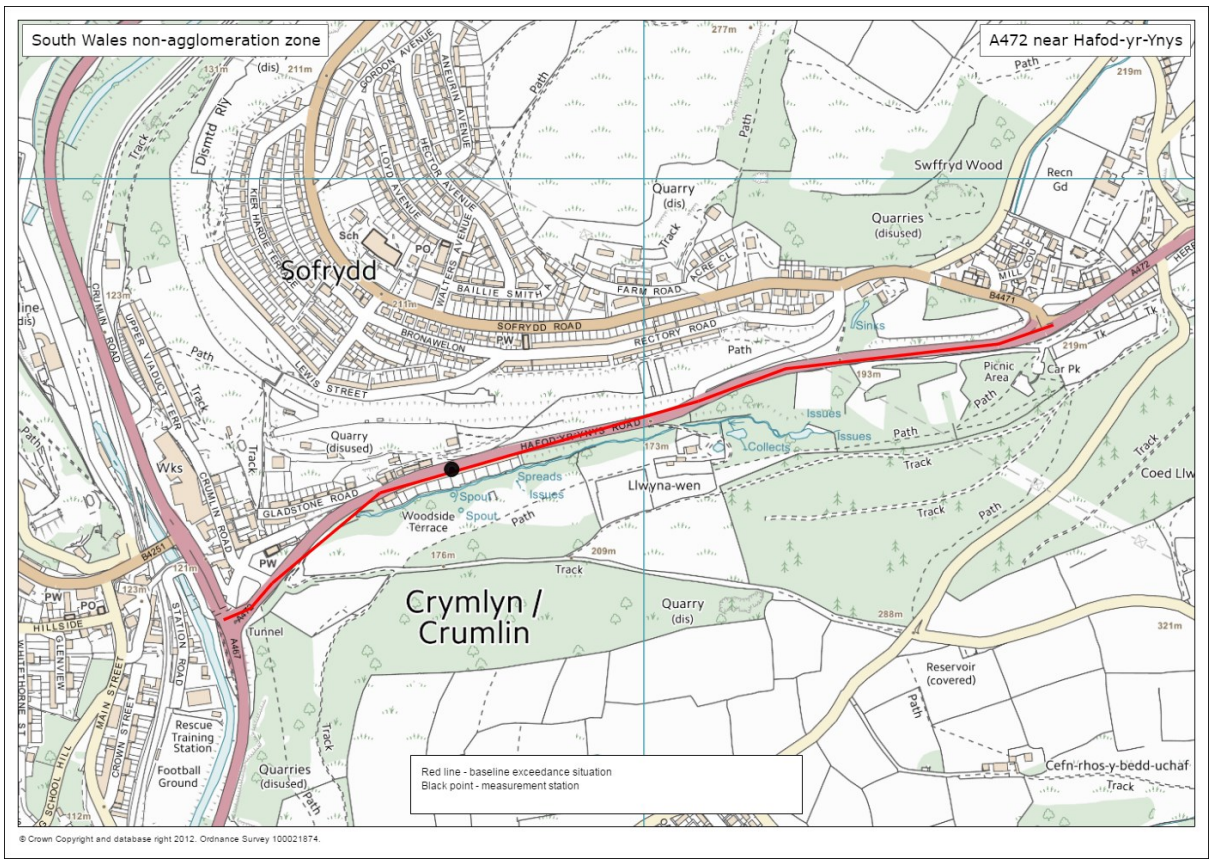


Figure 8: Exceedance situation in 2015 for A472 near Hafod-yr-ynys.

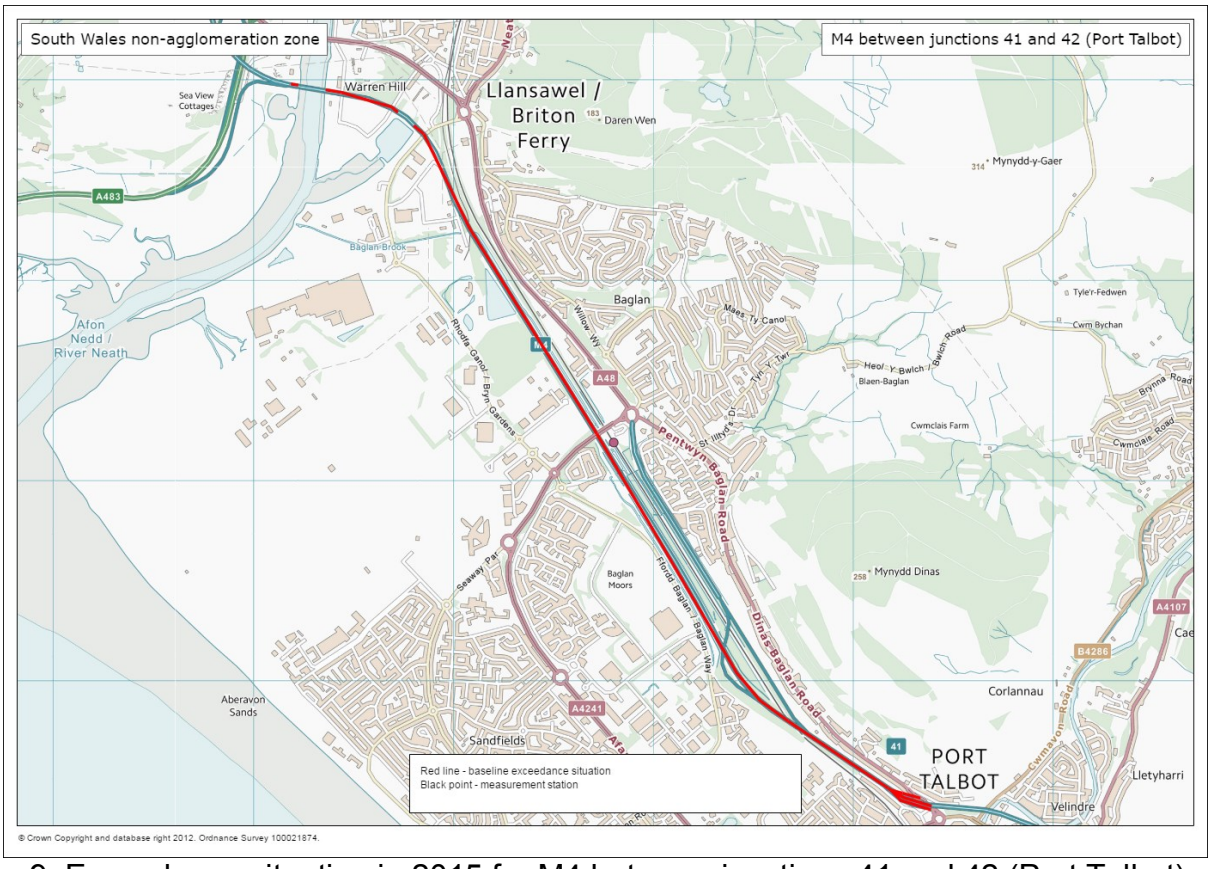


Figure 9: Exceedance situation in 2015 for M4 between junctions 41 and 42 (Port Talbot).

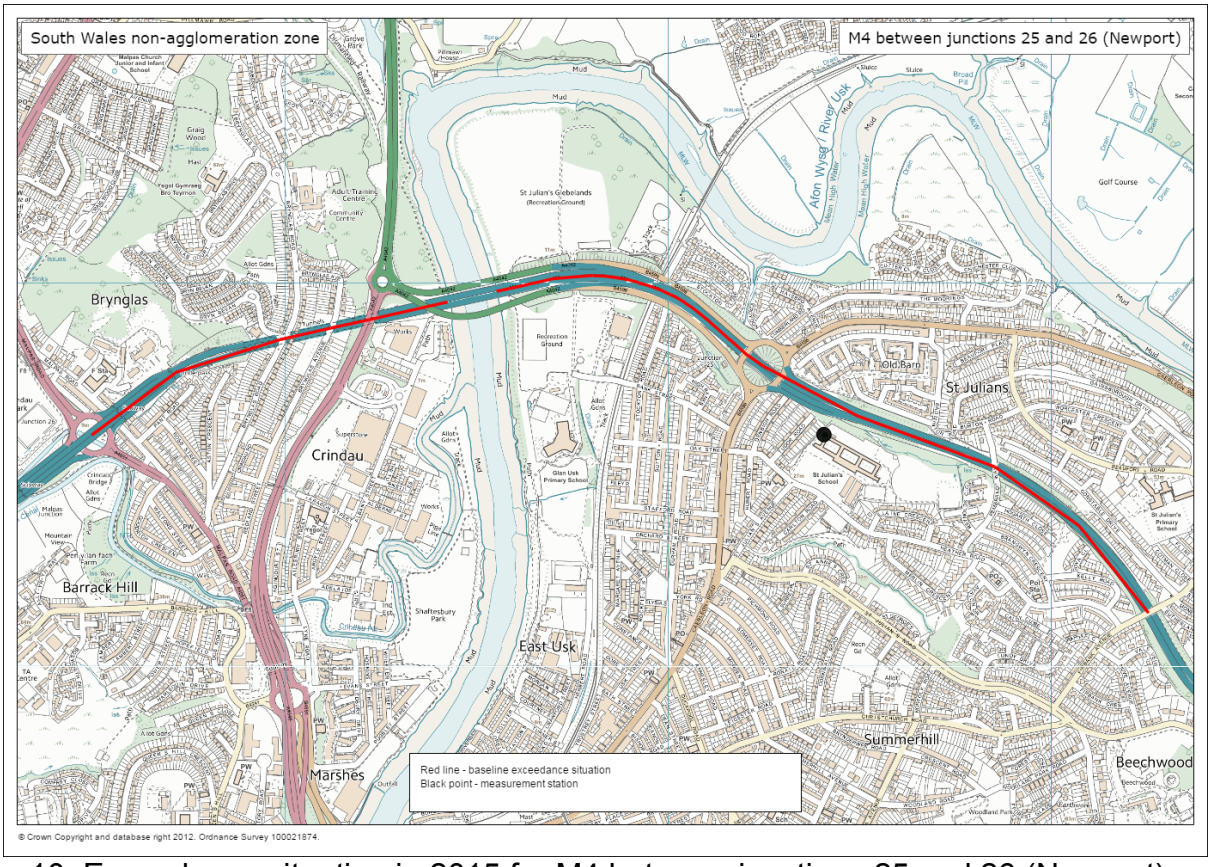


Figure 10: Exceedance situation in 2015 for M4 between junctions 25 and 26 (Newport)

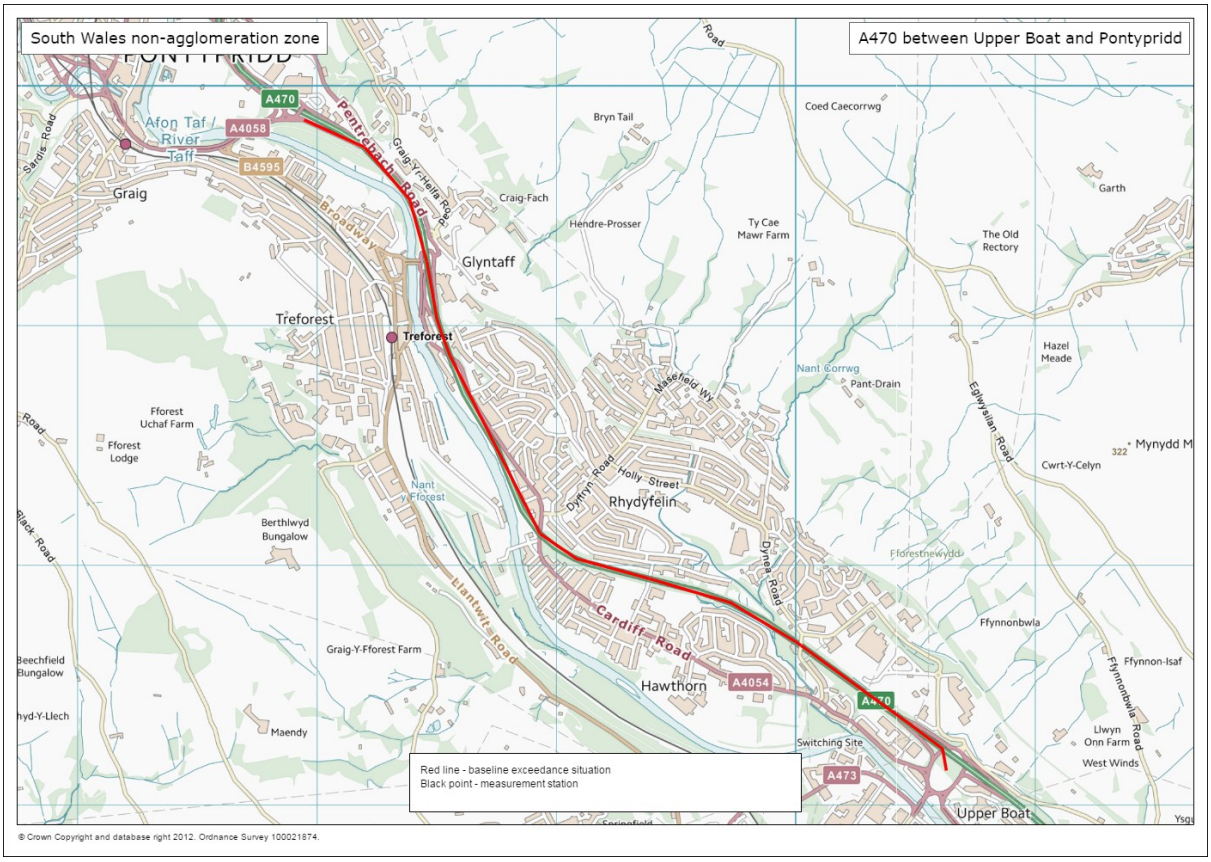


Figure 11: Exceedance situation in 2015 for A470 between Upper Boat and Pontypridd

North Wales non-agglomeration zone

Compliance with the annual limit value in this exceedance situation has been assessed using a combination of air quality measurements and modelling. There were no measured exceedances of the annual limit value in this zone in 2015, however, 7.7 km of road length was modelled to exceed the annual limit value. The roads which have been modelled as exceeding the annual limit value are the A494 at Deeside and the A483 near Wrexham.

The model results suggest that compliance with the NO_2 annual limit value is likely to be achieved by 2021 under baseline conditions.

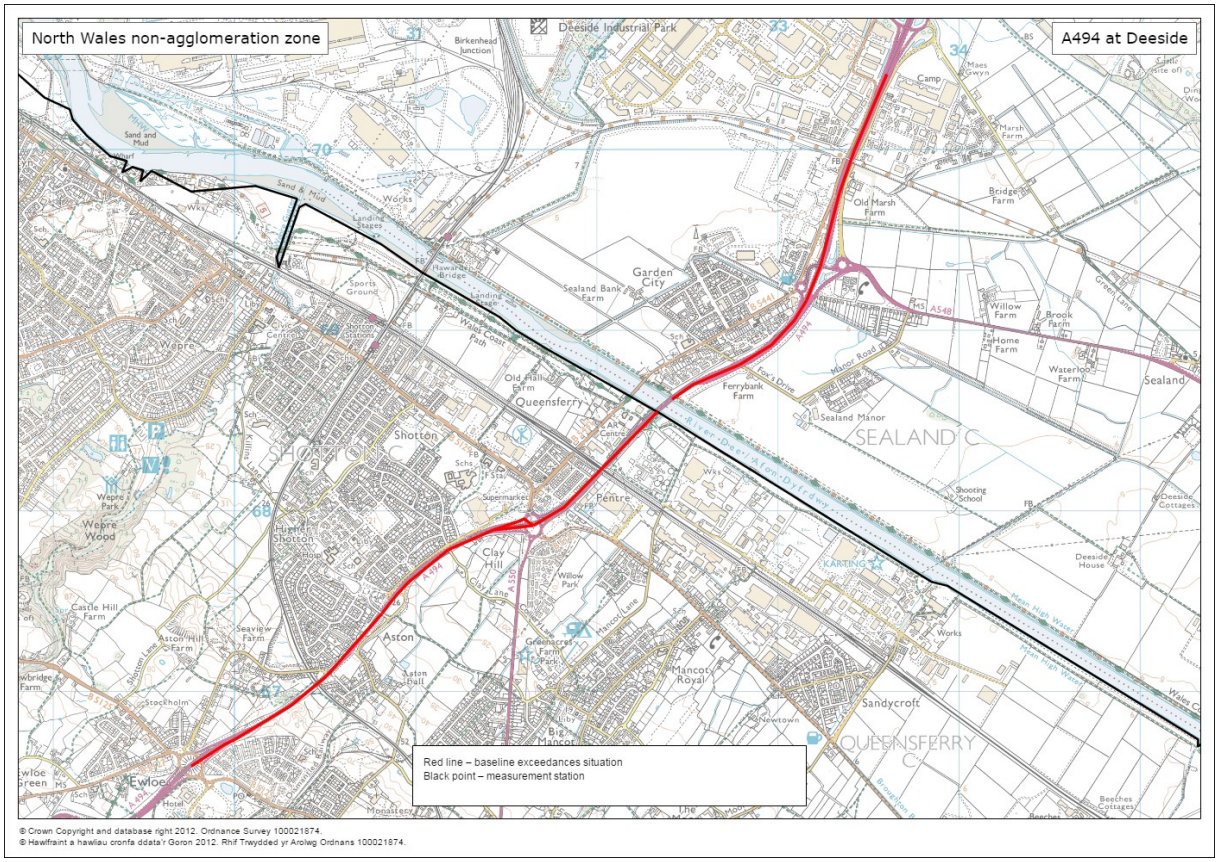


Figure 12: Exceedance situation in 2015 for A494 at Deeside

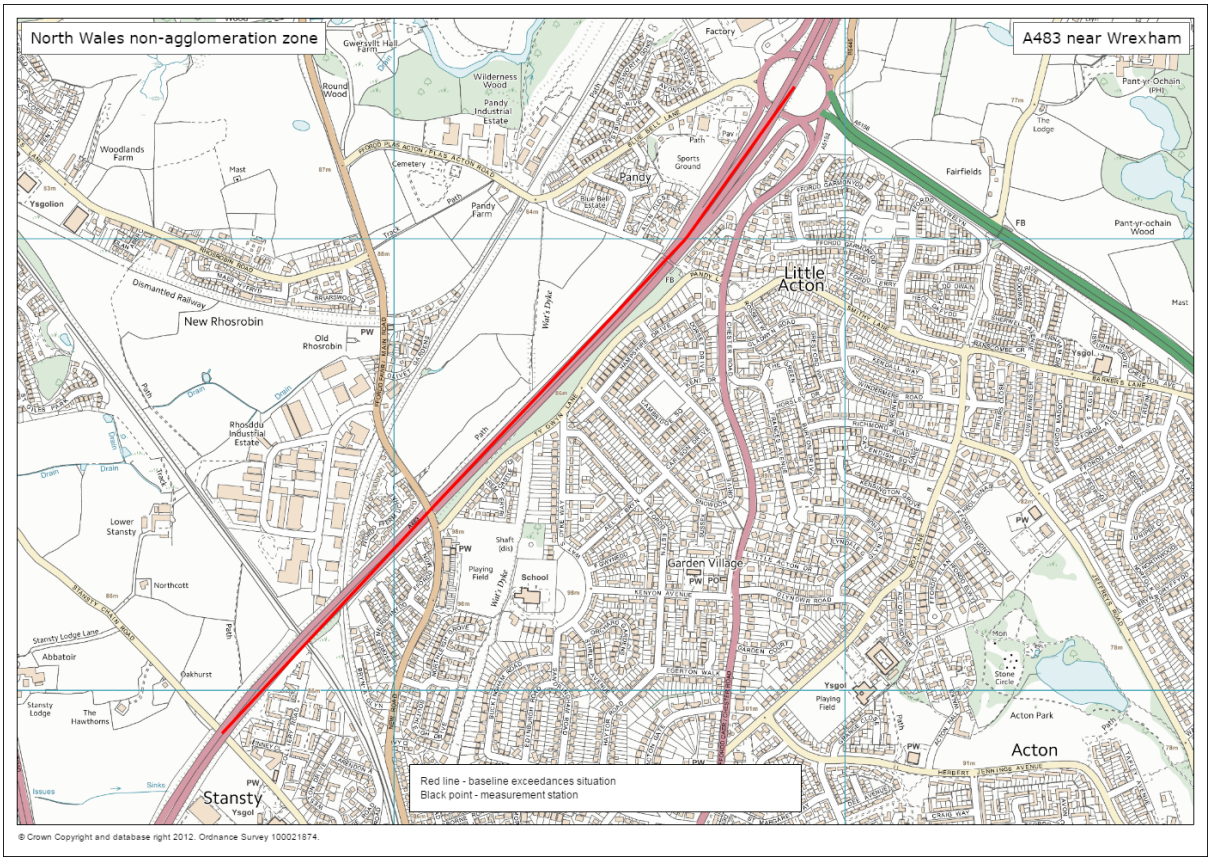


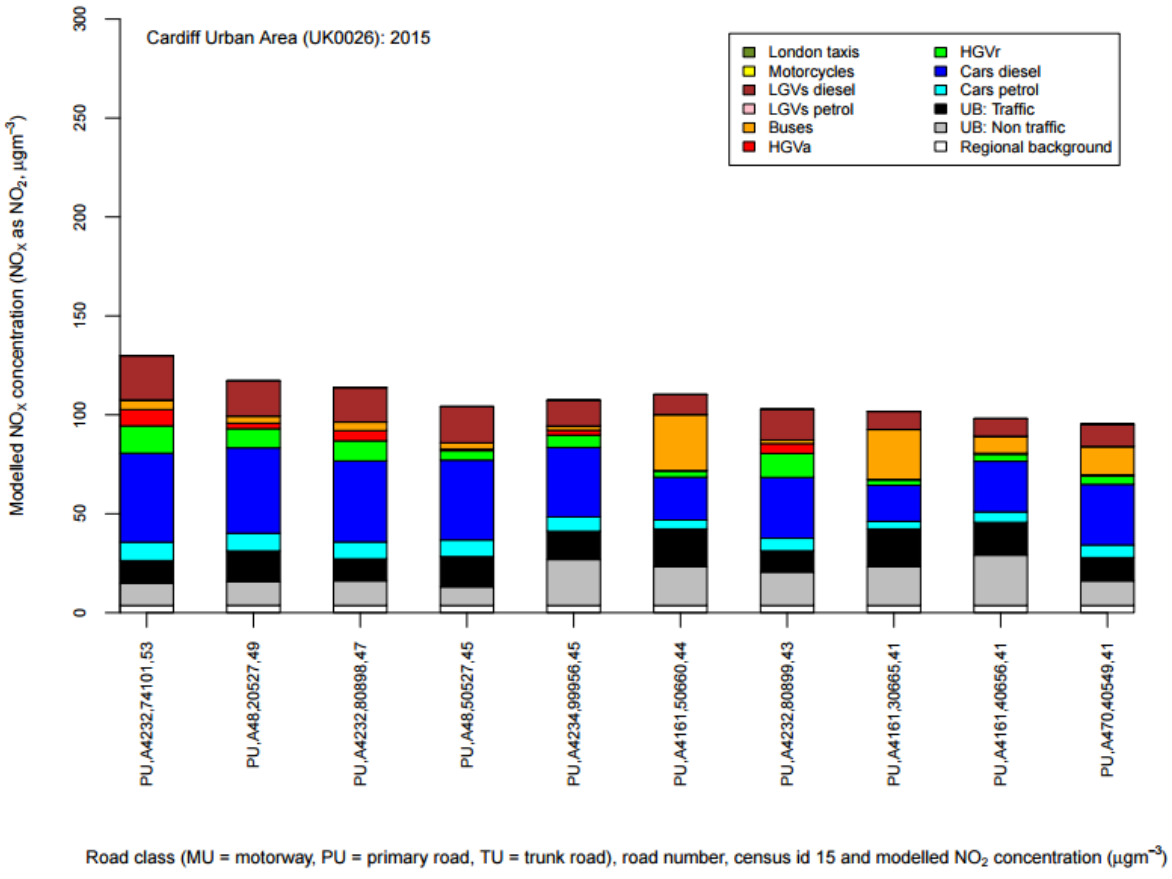
Figure 13: Exceedance situation in 2015 for A483 near Wrexham

Annex C – main sources of pollution in each zone

Cardiff Urban area

Local road traffic was the dominant source in this exceedance location in the reference year. The largest contribution was from diesel cars at the location of maximum exceedance with a contribution of 44.9 µgm-3 of NOX out of a total of 130 µgm-3 of NOX. Diesel cars, diesel LGVs and on some roads rigid and articulated HGVs and buses were important sources on the primary roads with the highest concentrations. This indicates that appropriate measures should impact on local road traffic sources in this zone. Other measures to address the urban background sources may also be beneficial.

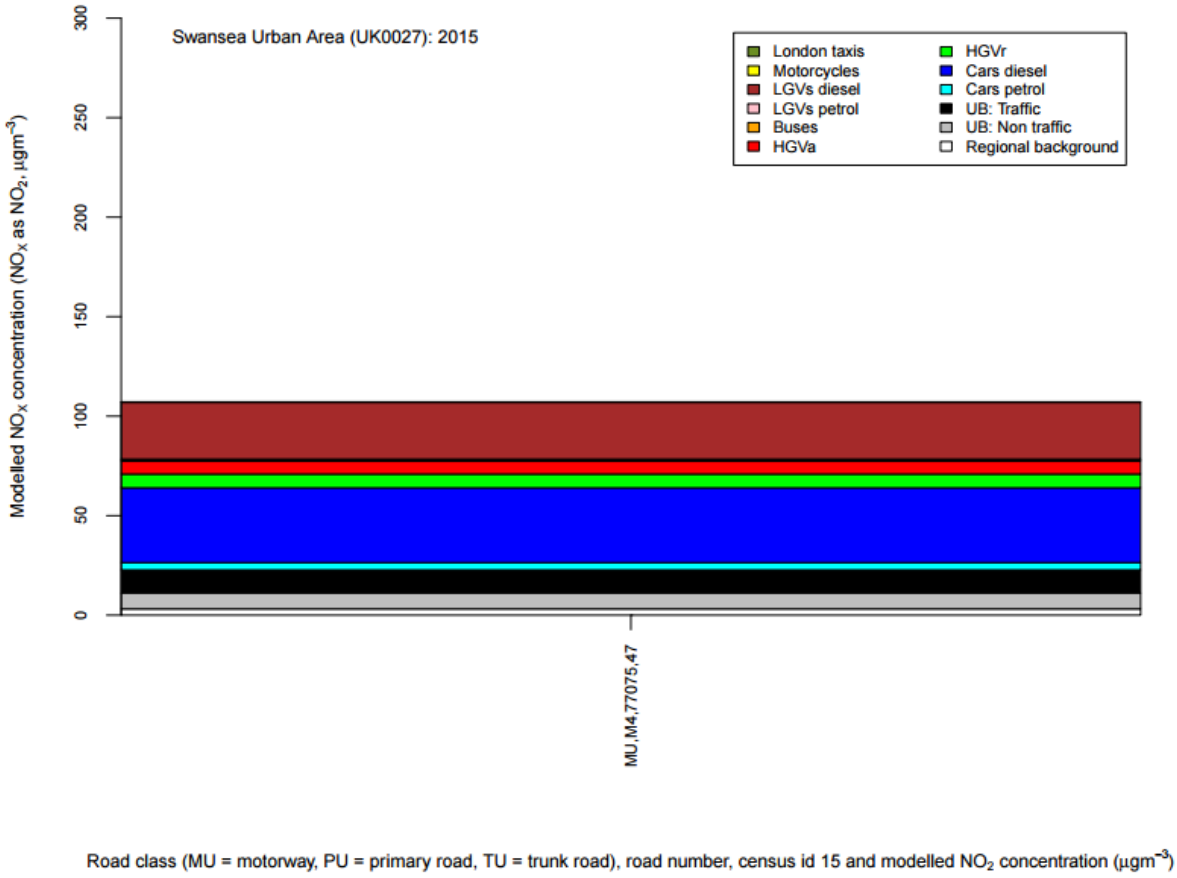
Annual mean roadside NOX source apportionment plots for all roads exceeding the annual mean NO2 limit value in 2015



Swansea Urban area

Local road traffic was the dominant source in this exceedance location in the reference year. The largest contribution was from diesel cars at the location of the exceedance with a contribution of 37.5 µgm-3 of NOX. LGVs provided the next largest contribution, contributing 28.5 µgm-3 to total NOX. This indicates that appropriate measures should impact on local road traffic sources in this zone. Other measures to address the urban background sources may also be beneficial.

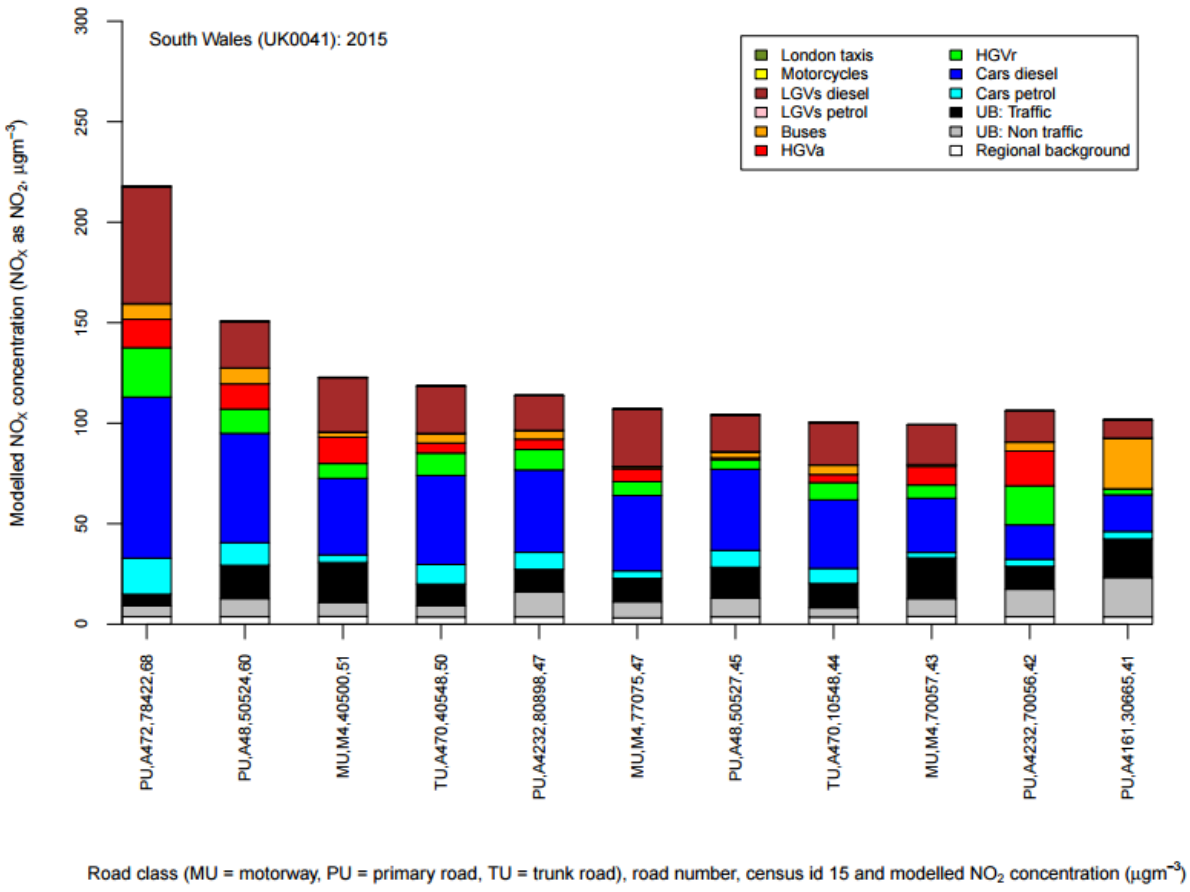
Annual mean roadside NOX source apportionment plots for all roads exceeding the annual mean NO2 limit value in 2015



South Wales non-agglomeration zone

Local road traffic was the dominant source in this exceedance location in the reference year. The largest contribution was from diesel cars at the location of maximum exceedance with a contribution of 80.1 µgm-3 of NOX out of a total of 218 µgm-3 of NOX. Diesel cars and diesel LGVs were important sources on the motorway roads with the highest concentrations in this exceedance situation. Diesel cars and diesel LGVs, and for some roads articulated HGVs and rigid HGVs or buses, were important sources on the primary roads with the highest concentrations. Diesel cars and diesel LGVs were important sources on the trunk roads with the highest concentrations. This indicates that appropriate measures should impact on local road traffic sources in this zone. Other measures to address the urban background sources may also be beneficial.

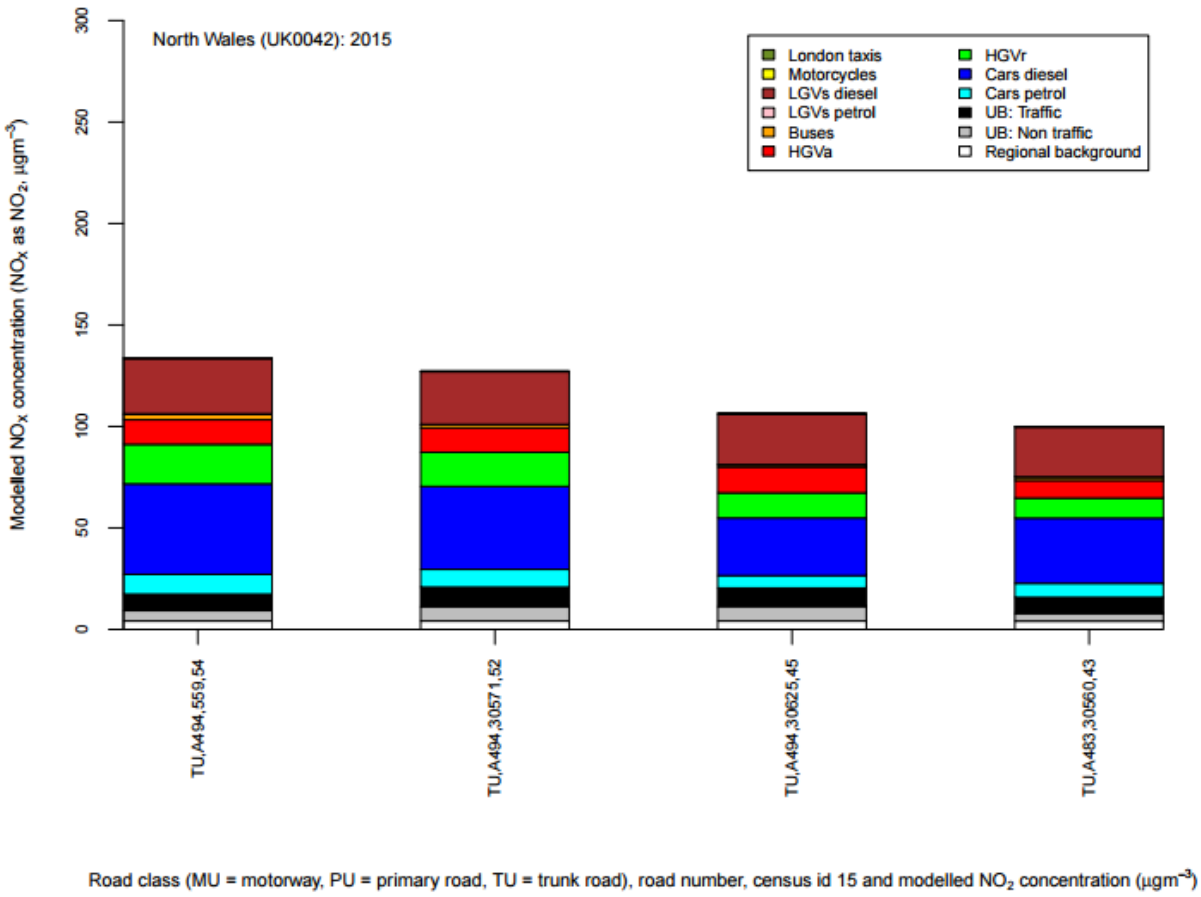
Annual mean roadside NOX source apportionment plots for all roads exceeding the annual mean NO2 limit value in 2015.



North Wales non-agglomeration zone

Local road traffic was the dominant source in this exceedance location in the reference year. The largest contribution was from diesel cars at the location of maximum exceedance with a contribution of 44.5 µgm-3 of NOX out of a total of 133.8 µgm-3 of NOX. Diesel cars and diesel LGVs were important sources on the trunk roads with the highest concentrations. This indicates that appropriate measures should impact on local road traffic sources in this zone. Other measures to address the urban background sources may also be beneficial.

Annual mean roadside NOX source apportionment plots for all roads exceeding the annual mean NO2 limit value in 2015.



Total quantity of emissions from these sources (tonnes per year)

Emissions from the National Atmospheric Emissions Inventory (NAEI) are mapped across the UK within a Geographic Information System (GIS). Emissions data is available from National Atmospheric Emissions Inventory <http://naei.defra.gov.uk/>

Annex D – Air Quality Plans prior to 2017

Details of UK-wide measures and measures taken in Wales prior to July 2017 are provided in UK Air Quality Plans highlighted below for the achievement of EU air quality limit values for nitrogen dioxide in the UK[38].

In September 2011, Defra, the Welsh Government and the other devolved administrations published updated air quality plans for the achievement of the NO_2 limits in the UK as soon as possible. This plan has been replaced by the plans listed below in this Annex. The 2011 plan was accompanied by a list of UK and national measures that helped to reduce or were expected to reduce concentrations of NO_2. The list covered UK measures[39] and specific measures in England, Scotland, Wales[40] and Northern Ireland. The measures listed had been introduced since the NO_2 limit values were agreed in 1999 and also included measures that had either just taken effect or were to be implemented shortly afterwards. Where possible, costs of the measures were included and impacts were quantified.

The 2011 plan was also accompanied by Welsh zone plans for the achievement of the EU air quality limit values for nitrogen dioxide (NO_2) in the Cardiff Urban Area[41], the Swansea Urban Area[42], North Wales [43]and South Wales[44].

In June 2012, the European Commission published its assessment of 24 of the 40 UK Air Quality Plans[45]. In response to the conclusions in this assessment, the UK submitted to the Commission new evidence with respect to projected compliance in the Northern Ireland zone and Re-Notifications for the Birkenhead, Preston and Swansea zones[46].

In December 2015, Defra, the Welsh Government and the other devolved administrations published updated air quality plans for the achievement of the NO_2 limits in the UK as soon as possible[47]. The 2015 plan was accompanied by a list of UK and national measures that have supported achievement of NO_2 limit values in the EU Ambient Air Quality Directive (2008/50/EC) in the shortest possible time. The list identified UK measures[48] and specific measures for England, Wales[49], Scotland and Northern Ireland.

[38] Air quality plans for nitrogen dioxide (NO_2) in the UK - Https://uk-air.defra.gov.uk/library/no2ten/index
[39] List of UK and National Measures September 2011- UK Measures – Page 4-31 – Https://uk-air.defra.gov.uk/assets/documents/no2ten/110921_List_of_UK_and_national_measures.pdf
[40] List of UK and National Measures September 2011- Wales Measures – Page 40-48 – Https://uk-air.defra.gov.uk/assets/documents/no2ten/110921_List_of_UK_and_national_measures.pdf
[41] Air Quality Plan for the achievement of EU air quality limit values for nitrogen dioxide (NO_2) in Cardiff Urban Area (UK0026)2011 - Https://uk-air.defra.gov.uk/assets/documents/no2ten/UK0026.pdf
[42] Air Quality Plan for the achievement of EU air quality limit values for nitrogen dioxide (NO_2) in Swansea Urban Area (UK0027) 2011 Https://uk-air.defra.gov.uk/library/no2ten/index?aid=27 and Https://uk-air.defra.gov.uk/assets/documents/no2ten/UK0027.pdf
[43] Air Quality Plan for the achievement of EU air quality limit values for nitrogen dioxide (NO_2) in North Wales 2011(UK0042) - Https://uk-air.defra.gov.uk/assets/documents/no2ten/UK0042.pdf
[44] Air Quality Plan for the achievement of EU air quality limit values for nitrogen dioxide (NO_2) in South Wales 2011(UK0041) - Https://uk-air.defra.gov.uk/assets/documents/no2ten/UK0041.pdf
[45] Commission Decision - 25.6.2012 - on the notification by the United Kingdom of Great Britain and Northern Ireland of a postponement of the deadline for attaining the limit values for NO_2 in 24 air quality
[46]Re-Notification of the Air Quality Plan to meet the Annual Mean NO_2 Limit Value in the Swansea Agglomeration, UK (UK0027) 2012Https://uk-air.defra.gov.uk/library/no2ten/index
[47] Improving air quality in the UK - Tackling nitrogen dioxide in our towns and cities 2015 - Https://www.gov.uk/government/publications/air-quality-in-the-uk-plan-to-reduce-nitrogen-dioxide-emissions.
[48] List of UK and national measures implemented or planned 2015 – UK Measures – Page 1 – 37 - Https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/486619/aq-plan-2015-list-uk-national-measures.pdf
[49]List of UK and national measures implemented or planned 2015 - Wales Measure Page44-55 Https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/486619/aq-plan-2015-list-uk-national-measures.pdf

The 2015 plan was also accompanied by Welsh zone plans for the achievement of the EU air quality limit values for nitrogen dioxide (NO_2) in the Cardiff Urban Area[50], the Swansea Urban Area[51], North Wales [52]and South Wales[53].

The 2017 Plan replaces all of the abovementioned plans detailed in this Annex.

[50] Air Quality Plan for the achievement of EU air quality limit value for nitrogen dioxide (NO_2) in Cardiff Urban Area (UK0026)2015 - Https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/632688/aq-plan-2015-cardiff-urban-area-uk0026.pdf
[51] Air Quality Plan for the achievement of EU air quality limit value for nitrogen dioxide (NO_2) in Swansea Urban Area (UK0027)2015 - Https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/632712/aq-plan-2015-swansea-urban-area-uk0027.pdf
[52] Air Quality Plan for the achievement of EU air quality limit value for nitrogen dioxide (NO_2) in North Wales (UK0042) 2015- Https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/632701/aq-plan-2015-north-wales-uk0042.pdf
[53] Air Quality Plan for the achievement of EU air quality limit value for nitrogen dioxide (NO_2) in South Wales (UK0041) 2015 - Https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/632710/aq-plan-2015-south-wales-uk0041.pdf

Annex E – Assessment of air pollution and historic concentrations

Nature and assessment of pollution

The annual assessment of compliance is based on a combination of information from the UK national monitoring networks and the results of modelling assessments. The Directive sets out how monitoring for the purpose of compliance assessment should be undertaken, including how many stations are required and detailed criteria on where to locate stations and the equipment that should be used. The number of stations required is calculated for each pollutant for each zone and is based on an assessment of concentrations over a five year period, together with population information for that zone. In accordance with the requirements of Articles 5 and 9 of the Directive, monitoring networks are reviewed periodically by the Department for the Environment, Food and Rural Affairs ("Defra") to ensure they remain compliant, with a minimum review requirement of once every 5 years. There are several air quality monitoring networks operating across the UK, each with different objectives, scope and coverage and these are operated on behalf of Defra and the Devolved Administrations by the Environment Agency (EA). The Automatic Urban and Rural Network (AURN) is the largest automatic monitoring network in the UK and forms the bulk of the UK's statutory compliance monitoring evidence base, including for NO_2.

The Directive also allows use of supplementary assessment using modelling and the number of stations required is more flexible where modelling is used. UK compliance assessment modelling is undertaken using national models known as the Pollution Climate Mapping ("PCM") models. The PCM models have been designed to assess compliance with the limit values at locations defined within the Directives.

The air quality assessment for each pollutant is derived from a combination of measured and modelled concentrations. Where both measurements and model results are available the assessment of compliance for each zone is based on the higher of the two. The air quality compliance assessment is submitted to the European Commission via e-Reporting. With respect to NO2, any exceedances of the hourly or annual limit value, where measured or modelled, will result in non-compliance within the respective zone or agglomeration being assessed.

Concentrations observed over previous years (before the implementation of the improvement measures)

From 2001 to 2012 the UK has reported annually on air quality concentrations using a standard Excel questionnaire (Decision 2004/461/EC). These questionnaires are available online from http://cdr.eionet. europa.eu/gb/eu/annualair. Since 2013 reporting has been via an e-reporting system (Decision 2011/850/EU) http://cdr.eionet.europa.eu/gb/eu/. In

addition, the UK has reported on air quality plans and programmes (Decision 2004/224/EC) since 2003. The most recent previous UK air quality plan for nitrogen dioxide was published in 2017. The plan and supporting documents are available at https://uk-air.defra.gov.uk/library/no2ten/ and the submission of this plan via e-reporting is published at http://cdr.eionet.europa. eu/gb/eu/aqd/h/envvryhbq/. Historic plans and programmes are available on http://cdr.eionet.europa.eu/gb/eu/ aqpp

Cardiff Urban area agglomeration zone

Measured annual mean NO2 concentrations at national network stations in Cardiff Urban area agglomeration zone NO2_UK0026_Annual_1 for 2001 onwards, µgm-3 (a). Data capture shown in brackets.

Site name (EOI code)	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Cardiff Centre (GB0580A)	33 (93)	33 (94)	35 (87)	30 (97)	35 (56)	31 (97)	31 (98)	29 (99)	31 (98)	33 (95)	27 (95)	27 (91)	26 (96)	25 (98)	27 (80)

Annual mean NO2 model results in Cardiff Urban area agglomeration zone NO2_UK0026_Annual_1 for 2001 onwards.

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Road length exceeding (km)	19.5	3.1	37.6	17.1	16.1	16.0	15.6	18.4	18.8	25.9	24.3	23.2	19.8	19.8	16.3
Background exceeding (km^2)	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0
Maximum modelled concentration (μgm^{-3}) (a)	48.9	46.1	62.3	61.0	58.6	58.5	62.6	58.7	57.5	60.9	55	69	54	60	53

Swansea Urban area agglomeration zone

Measured annual mean NO2 concentrations at national network stations in Swansea Urban area agglomeration zone NO2_UK0027_Annual_1 for 2001 onwards, µgm-3 (a). Data capture shown in brackets

Site name (EOI code)	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Port Talbot (GB0651A)	22 (96)	19 (97)	22 (97)	21 (84)	19 (97)	18 (97)	18 (55)								
Port Talbot Margam (GB0906A)							19 (42)	18 (95)	17 (95)	19 (96)	18 (99)	18 (99)	17 (95)	17 (91)	17 (94)
Swansea (GB0609A)	36 (95)	31 (98)	34 (98)	37 (91)	34 (95)	31 (54)									
Swansea Roadside (GB0896A)						36 (28)	31 (98)	32 (99)	33 (99)	36 (99)	32 (99)	31 (99)	31 (99)	31 (99)	27 (99)

Annual mean NO2 model results in Swansea Urban area agglomeration zone NO2_UK0027_Annual_1 for 2001 onwards.

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Road length exceeding (km)	0.0	3.4	11.3	0.0	0.0	0.0	2.5	2.5	5.4	5.4	5.4	2.7	2.7	2.7	2.7
Background exceeding (km^2)	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Maximum modelled concentration (μgm^{-3}) (a)	38.4	49.9	72.6	39.5	37.2	38.5	41.8	44.1	56.5	58.6	47	46	48	42	47

South Wales non-agglomeration zone

Measured annual mean NO2 concentrations at national network stations in NO2_UK0041_Annual_1 for 2001 onwards, µgm-3 (a). Data capture shown in brackets.

Site name (EOI code)	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Chepstow A48 (GB0921A)								41 (98)	38 (97)	39 (99)	40 (99)	41 (72)	36 (96)	39 (91)	37 (98)
Cwmbran (GB0744A)	18 (43)	20 (90)	19 (88)	17 (99)	17 (99)	14 (96)	14 (82)	14 (88)	14 (91)	16 (98)	13 (99)	14 (95)	13 (99)	12 (99)	12 (99)
Narberth (GB0043R)	7 (64)	7 (86)	9 (79)	5 (89)	5 (92)	5 (94)	5 (89)	6 (94)	5 (92)	5 (95)	4 (98)	6 (76)	5 (98)	4 (98)	3 (99)
Newport (GB0962A)								24 (97)	25 (99)	26 (96)	22 (91)	22 (96)	23 (89)	22 (95)	21 (86)
Hafod-yr-ynys Roadside (GB1038A)														78 (21)	68 (99)

Table 2: Annual mean NO2 model results in NO2_UK0041_Annual_1 for 2001 onwards.

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015(b)
Road length exceeding (km)	30.3	14.5	96.2	50.7	47.7	44.2	44.2	31.5	38.1	42.4	38.5	32.6	30.3	25.3	15.1
Background exceeding (km^2)	1	0	0	0	0	0	0	0	0	2	0	0	0	0	0
Maximum modelled concentration (μgm^{-3}) (a)	54.0	63.8	81.1	67.6	71.6	69.5	67.9	72.0	70.9	73.7	70	69	66	60	68

North Wales non-agglomeration zone

Measured annual mean NO2 concentrations at national network stations in North Wales non-agglomeration zone UK0042_Annual_1 for 2001 onwards, µgm-3 (a). Data capture shown in brackets

Site name (EOI code)	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Aston Hill (GB0031R)			10 (19)	6 (87)	5 (98)	5 (70)	13 (92)	6 (85)	5 (91)	6 (99)	5 (99)	4 (98)	5 (97)	4 (94)	3 (98)
Mold (GB0999A)										17 (31)	11 (92)	10 (76)	9 (82)		
Wrexham (GB0755A)		24 (78)	25 (98)	21 (96)	19 (95)	21 (94)	20 (92)	20 (99)	21 (99)	24 (97)	19 (99)	20 (95)	22 (97)	21 (94)	19 (99)

Annual mean NO2 model results in North Wales non-agglomeration zone

NO2_UK0042_Annual_1 for 2001 onwards.

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Road length exceeding (km)	0.0	0.0	21.3	12.7	12.7	12.7	13.4	11.0	11.0	10.4	9.7	9.6	7.7	5.8	7.7
Background exceeding (km^2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Maximum modelled concentration (μgm^{-3}) (a)	39.7	37.4	67.6	64.9	67.8	68.9	67.3	59.2	62.6	71.5	64	62	55	48	54

Latest measurement data are available from https://uk-air.defra.gov.uk. Since 2013 reporting to the European Commission has been via an e-reporting system (Decision 2011/850/EU) available from http://cdr.eionet.europa.eu/gb/eu/.

Techniques used for the assessment

In brief, emissions from the National Atmospheric Emissions Inventory (NAEI)22 are mapped across the UK within a Geographic Information System (GIS). Deterministic dispersion models specific to each pollutant are used to simulate atmospheric mixing and to generate background concentrations for different pollutants. The modelled results are then calibrated against measured concentrations from the national monitoring network and then verified. This modelling provides an estimate of the distribution of atmospheric pollutants including NO2 on a 1km x 1km grid and for individual roads. Collectively, this is known as the Pollution Climate Mapping (PCM) model and is operated on behalf of Defra by Ricardo Energy & Environment.

For detailed information on the UK assessment method, the 2017 Plan technical report, in conjunction with the respective zone plans, provides details of the methods used to model and monitor air quality to assess compliance with NO2 limits and to model future concentrations. https://www.gov.uk/government/publications/air-quality-plan-for-nitrogen-dioxide-no2-in-uk-2017

A full description of modelling techniques and assumptions to be used by local authorities in the course of future feasibility studies is provided in annex F.

Annex F - Modelling techniques to be used and assumptions to be made by local authorities in relation to feasibility assessments

Local authorities named in this plan are required to undertake local assessments to consider the best option to achieve compliance within the shortest possible time. There are legally binding limit values for concentrations of several pollutants in outdoor air, including NO2. The UK Government uses a combination of national modelling and monitoring in accordance with legislation to determine the concentrations of these pollutants in order to assess compliance.

The Pollution Climate Mapping (PCM) model is the UK's national air quality model and provides outputs of pollutant concentrations in the UK at a 1x1 km resolution and also at around 9,000 roadside locations for urban major roads (A and M class roads). Emissions from the National Atmospheric Emissions Inventory (NAEI) are mapped across the UK within a Geographic Information System (GIS). Deterministic dispersion models specific to each pollutant are used to simulate atmospheric mixing and to generate background concentrations for different pollutants. The modelled results are then calibrated against measured concentrations from the national monitoring network and then verified. This modelling provides an estimate of the distribution of atmospheric pollutants including NO2 on a 1km x 1km grid and for individual roads. Collectively, this is known as the Pollution Climate Mapping (PCM) model and is operated on behalf of Defra by Ricardo Energy & Environment. For detailed information on the UK assessment method, the 2017 Plan technical report, in conjunction with the respective zone plans, provides details of the methods used to model and monitor air quality to assess compliance with NO2 limits and to model future concentrations available https://www.gov.uk/government/publications/air-quality-plan-for-nitrogen-dioxide-no2-in-uk-2017.

Local authorities identified by the PCM model as having persistent NO_2 exceedances are required to implement local plans to reduce pollution to compliant levels in the shortest time possible. The measures implemented as part of the local plan need to be informed by local evidence and understanding. Local authority feasibility studies will provide robust evidence on the impact of measures, informed by local traffic and air quality models. This will provide a more detailed assessment of the specific local situation than the national air quality model. In submitting their proposals for feasibility studies, the Welsh Government will review the local authorities' proposed approaches. The Welsh Government will ensure the review process is robust by including independent experts on a review panel. Examples of expected approaches for review would include the proposed traffic and air quality monitoring collation, air dispersion, traffic and economic modelling and comparison with the

national assessment. The Welsh Government will work with the local authorities to frequently review the approaches taken to ensure they are robust and appropriate. In addition the Welsh Government expects local authorities to outline whether they are designing a local plan to address exceedances in a larger area or focus on a few roads. The local evidence base will need to consider roads which are currently not in compliance and likely not to be in the future.

Criteria for Transport Modelling

Welsh Government's transport appraisal guidance, WelTAG[54], recommends that the methods used to model transport impacts should follow the advice set out by the Department of Transport in their Transport Appraisal Guidance (WebTAG).

Automatic Number Plate Recognition Traffic survey

Local authorities should determine traffic fleet compositions (including the Euro standard proportions) using traffic survey data that is less than 5 years old. The survey data should be derived from Automatic Number Plate Recognition (ANPR) cameras and associated equipment at key locations to simultaneously monitor traffic coming into/out of the study area over a continuous seven day period. The data should be representative of long term annual average and should capture vehicle registrations twenty four hours per day in both directions alongside the location, direction of travel and time at each of the survey locations. Surveys should cover the major routes that will provide effective coverage of journeys in to the study area (the area expected to be affected significantly by measures to be implemented under the local plan).

Transport Models

The model domain should cover any significant traffic re-routing that may result from the implementation of local measures and include all roads that are listed within the national PCM model for the study area. All roads where the limit value is either known to be exceeded in the most recent historical assessment or are likely to exceed thereafter should also be included. The most recent historical assessment should include the national compliance data for NO2 and can be supplemented with local data on exceedances. The traffic model road network should be geographically accurate in order to ensure the correct mapping of transport road links into those in air quality model.

Modelling input data should aim to be validated against recently observed data from the study area (less than 5 years old), in line with WebTAG Unit M3.1 requirements. Variables

[54] https://beta.gov.wales/welsh-transport-appraisal-guidance-weltag

such as fleet composition, flows, link and turning movements, traffic pattern and journey time should be compared with observed values from an ANPR survey or similar which is less than 5 years old. The modelling should be in accordance WebTAG validation guidance as far as is reasonably possible, and justified where it isn't.

Input Data

Observation data are preferred over modelled data. Where modelled data is used it should be validated.

Air quality modelling will require data in relation to buses, taxis, coaches, rigid HGVs, articulated HGVs, LGVs, cars and motorcycles and that if this level of detail is not available via the traffic model, then data will need to be acquired in another way, such as from post processing of transport modelling, or separate studies on vehicle numbers. The model should include any further vehicle types as required in order to model the likely measures (e.g. electric vehicles). The data should include at least fuel type and their engine emission standard.

Criteria for Air Quality Modelling

Air quality modelling should be undertaken following the broad principles defined in Local Air Quality Management guidance[55].

Source term estimation

An appropriate emissions model should be selected which uses the latest COPERT emission factors and allows users to define their vehicle fleet composition by vehicle type, fuel type and Euro standard. The Welsh Government will make available the latest Emissions Factor Toolkit (EFT), containing the latest emission factors, to the relevant local authorities. If using a different model, it should be appropriately validated against the EFT to ensure consistency of outputs across different categories and years. Gradient effects should be included where appropriate (particularly on roads with a gradient of greater than 2.5%)[56].

[55] http://gov.wales/topics/environmentcountryside/epq/airqualitypollution/airquality/guidance/technical-guidance/?lang=en
[56] Refer to TG16 paragraph 7.437

Air quality model domain

The domain of the model should include all roads that are listed within the national PCM model for the study area. All roads where the NO_2 limit value is either known to be exceeded in the most recent historical assessment or are likely to exceed thereafter should be included. The most recent historical assessment should include the national compliance data and can be supplemented with local data on exceedances. All potential displacement routes should be included (routes that traffic may be diverted to if measures are implemented).

Air quality model receptor resolution

The following receptor locations should be included in the model:
1) Receptor grid. The grid should be at a resolution of at least 10m x 10m within the first 50m from roads. The roadside receptors will be used to calculate population-weighted mean concentration values.
2) Discrete receptors:

i. Monitoring site locations. These receptors will be required in order to compare with modelling predictions.
ii. A receptor for each link modelled in the PCM model, at 2m height and 4m distance from the kerbside. This will facilitate a comparison between the local model results and the PCM model.
iii. A receptor for each location identified as either exceeding or likely to exceed the NO2 limit between the most recent historic assessment and projected years inclusive. Where these locations are local roads, the receptor should be at 2m height and 4m distance from the kerbside.

Compliance should be assessed at locations in accordance with the Ambient Air Quality Directive (AQD) (Annex III: A, B, and C).

The macro and micro siting criteria listed in Annex III of the AQD should be considered carefully when defining receptors for compliance assessments. The receptors should be at least 25m from major junctions and be representative of at least 100m road length. The siting criteria are different to those specified in TG16, which are typically at the highest pollution hotspot. Receptors within the carriageway of the road must be excluded except where there is normally pedestrian access to the central reservation.

Base year

The air quality model should use the most recent base year, allowing comparison of the model predictions with the most recent measurement data. The transport model base year should preferably be the same as the air quality model base year, but where this is not practical, forecast years from the transport model can be used if the local authority can demonstrate that there has been no significant change in fleet or network compared to the transport base year.

The model should be calibrated against meteorological and measurement data from the same year as the base year. The appropriate base year and meteorological site location should be used when considering meteorological data. For information on meteorological data requirements please refer to TG16 paragraphs 7.476 to 7.489.

Input data from traffic model

Air quality modelling will require data in relation to buses, taxis, coaches, rigid HGVs, articulated HGVs, LGVs, cars and motorcycles, and that if this level of detail is not available via the traffic model, then data will need to be acquired in another way, such as from post processing of transport modelling or separate studies on vehicle numbers.

A realistic representation of road locations is required - roads cannot be represented as straight lines between junctions. This may be achieved using a georeferenced transport model, or including an additional step to transfer the traffic counts from the transport model to a more realistic representation of the geography of the roads. Welsh Government managed roads within the model area should be included in the modelling but will be treated separately when comparing the results of the local model to the national PCM model.
The distribution of vehicles by Euro standard should be included in the dispersion model. Information on this distribution for the local fleet will come from local ANPR data collection. The distribution from the updated EFT may be used as a back-up where local fleet composition is not available by Euro standard (e.g. motorways). Where local fleet projections differ from national-based projections significantly, rationale for this must be outlined.

Measured vehicle speed data for the local area should be used where possible, instead of national data e.g. from Trafficmaster.

NO_x to NO_2 emissions assumptions

Primary NO_2 fractions (f-NO_2) should be calculated using the guidance notes and spreadsheet on the NAEI website9[57].

Non-road transport modelling

If potential non-transport measures exist then they should be accounted for within the modelling. If the local authority decides not to model non-transport sources, it should set out why it is confident there are no potential material measures from these sources. In the event that no measures are being considered for non-transport sources, the LAQM background maps[58] can be used to define the contribution to ambient concentrations from non-local sources. The contribution from local road transport sources that are modelled should be subtracted from the background maps. Alternatively local authorities may model all sources rather than use the background maps if they wish. If non-transport measures are planned, local authorities should model non-transport sources separately and remove their contribution from the background maps.

Measurement data for model comparison

Model predictions should be compared with measurement data to check they agree within the expected uncertainty bounds. Where they do not, a robust uncertainty assessment should be carried out and an explanation provided. Where no practical explanation can be identified, the modelling predictions may need to scaled according to nearby roadside monitoring station data, or if not available, bias adjusted diffusion tube data.

All available measurement data within the study area should be included in the comparison, unless there is reason to believe that certain data is unreliable or unrepresentative (e.g. data quality issues). Justification of exclusion of any monitored data should be provided to Welsh Government.

Criteria for Projections Modelling

Projections without additional mitigation measures

Annual projections should be assessed between the base year and compliance year to ensure that a clear pathway towards compliance is demonstrated by the study. Interpolation methods can be used to estimate impacts in interim years to ensure robust modelling can be completed in the shortest possible time. However, additional years should also be modelled if infrastructure changes are expected to have a significant impact on air quality

[57] http://naei.defra.gov.uk/data/ef-transport
[58] http://laqm.defra.gov.uk/review-and-assessment/tools/background-maps.html

when measures are in place (e.g. currently planned road layout changes or housing development projects).

Projected fleet composition calculated using local projections is preferred. Any local assumptions made should be explained clearly. If local projections are not available, the national fleet composition projections from EFT can be used. Where local fleet projections differ from national-based projections significantly, rationale for this must be outlined. Road traffic fleet growth rates should be calculated using the Trip End Model Presentation Program or TEMPro11 to generate the projected fleet based on national information. TEMPro is software that allows users to view travel forecasts up to 2051 from the National Trip End Model (NTEM) datasets. Alternatively, local assumptions may be made, in which case these should be explained.

The fleet penetration of vehicles that meet more stringent Euro standards (e.g. Euro 6d based on real driving emissions) should be included in all projections. Local authorities should calculate expected emissions of the fleet under baseline conditions for NO_2, particulate matter ($PM_{2.5}$ and PM_{10}) and carbon dioxide (CO_2) for 10 years after the compliance year. This is needed to compare long term costs and benefits of options that are equally effective (i.e. equally able to achieve compliance in the shortest time possible). Interpolation methods can be used.

Projections modelling with measures included

Local authorities should model projections for the earliest year by which they expect to be able to achieve compliance through having taken measures to address exceedances, which should be no later than 2021. Annual projections should be assessed between the base year and compliance year to ensure that a clear pathway towards compliance is demonstrated by the study. Additional years should also be modelled if relevant, for example if major infrastructure changes are expected that might affect air quality. Interpolation methods can be used to estimate impacts in interim years.
The measures to be modelled will vary depending on the local authority.

Local authorities should calculate expected emissions of the fleet under each short list option for NO_2, particulate matter ($PM_{2.5}$ and PM_{10}) and carbon dioxide (CO_2) for 10 years after the compliance year. This is needed to compare long term costs and benefits of options that are equally effective. Interpolation methods can be used.

Behavioural response assumptions

An assessment of the behavioural responses will be necessary for all measures to understand their impacts. These could include responses to measures for access restrictions, encouraging an uptake of electric vehicles, retrofitting vehicles with clean technology, encouraging active travel, amongst others.

Within Defra's PCM modelling for the introduction of charging measures the response of affected drivers was categorised, as shown in Table 3.3 of the 2017 Plan Technical Report. However, detailed local data is to be preferred where available. Where a measure is being assessed, the same categories of behavioural responses should be used as a minimum. For some options it may be necessary to allow drivers to take a different response, such as changing mode of travel. Local authorities should obtain localised information on how drivers might respond to measures themselves. The accessibility of diversion (or avoidance) routes might vary according to the local road infrastructure, for instance.