

Air Quality Strategy for Wiltshire

2011 - 2015



Foreword

Residents, businesses and visitors to Wiltshire all enjoy the extensive areas of unspoilt countryside, including the very good air quality. However, there are a few specific areas in our market towns that have issues with transport related pollution.

These issues are difficult to address because of the increasing dependence we all have upon motor vehicles, whether for pleasure or business and transportation of goods.

This strategy recognises that no one single agency, department or community has all the answers; improvements to air quality can only be achieved by taking an integrated, collaborative approach. It acknowledges that economic growth and improving the local environment are not mutually exclusive.

The document provides an overview of air quality across Wiltshire and focuses on key areas where air quality could and should be improved.

I am delighted to commend this strategy as a key step towards tackling our areas of traffic related pollution to safeguard the health of those who live and work in Wiltshire.

Maggie Rae

Director of Public Health
and Public Protection
NHS Wiltshire and Wiltshire Council

Councillor Keith Humphries

Portfolio holder for Public Health
and Public Protection

Contents

Contents

	Executive Summary	1
1	Introduction.....	2
1.1	The importance of air quality	2
1.2	Clean air in Wiltshire.....	3
1.3	The aims of the strategy	3
1.4	Contents of the Air Quality Strategy	4
2	The regulatory framework for air quality.....	6
2.1	International and national drivers.....	6
2.2	International drivers for air quality	6
2.3	Development of air quality legislation in the UK.....	7
2.4	Related legislation and activity	7
2.5	Possible pollutants of concern	9
3	Scope of the air quality strategy	10
3.1	Limitations of the strategy	10
4	Wiltshire in context	12
4.1	The air we breathe.....	12
4.2	The air quality assessment process	14
4.3	Pollutants of concern in Wiltshire	15
4.4	Measurement techniques	17
4.5	Data in Wiltshire	19
5	Improving air quality	20
5.1	Air quality achievements to date	20
5.2	Recognising the need for a thematic approach.....	21
5.3	Key influences on air quality in Wiltshire.....	21
6	Identifying common themes	22
6.1	Common strategic aims.....	22
6.2	Funding of improvements	23
7	Strategic objectives.....	25
7.1	Development of objectives.....	25
7.2	Securing improvements in existing Air Quality Management Areas (AQMAs) (SO1).....	26
7.3	Prioritisation of air quality improvements (SO2)	26
7.4	Prioritise new sites for investigation (SO3).....	26
7.5	Maintain or improve current air quality (SO4).....	27
7.6	Improved collaborative working (SO5)	27
7.7	More efficient use of resources (SO6)	29
7.8	Improved public information and consultation (SO7)	29
7.9	Provide high quality public information and guidance on air quality (SO8)	30
7.10	Provide comprehensive mapping layers and data via the corporate graphical information system (GIS) (SO9).....	31
7.11	Support planned economic growth, sustainable transport alternatives and reductions in climate change emissions (SO10).....	31

8	Conclusions	32
8.1	The way ahead	32
8.2	Action plan	32
	Appendices	38
	Appendix 1 Table of UK Air Pollution Objectives and Health Effects	39
	Appendix 2 Air Quality Management Areas in Wiltshire	41
	Appendix 3 Monitoring techniques, methodologies and data processing	47

Table of Figures

Figure 1 Summary of legal framework	8
Figure 2 Pollutants to be assessed	9
Figure 3 Scope of the strategy	11
Figure 4 Local authorities with AQMAs	12
Figure 5 Highest NO ₂ readings in south west	13
Figure 6 Air quality assessment process	15
Figure 7 Pollutants relevant to Wiltshire	16
Figure 8 Map showing Diffusion Tube Locations	18
Figure 9 Graph showing diffusion tube results	19
Figure 10 Priorities for improvements in air quality	21
Figure 11 Four key ways to improve air quality	21
Figure 12 Common themes in Wiltshire strategies	22
Figure 13 Table of strategic links	24
Figure 14 Strategic objectives	25
Figure 15 Advantages of timely interventions	28
Figure 16 Strategic action plan	33

Executive Summary

Local authorities have a duty to monitor air quality within their areas having regard to national air quality objectives and standards and report this information to Department of for Environment Food and Rural Affairs (Defra) on an annual basis. There are seven pollutants which we are required to consider under European and UK law, these include lead, benzene and sulphur dioxide.

Air quality in Wiltshire is predominantly good with the majority of the County having clean unpolluted air. There are however a small number of locations where the combination of traffic, road layout and geography has resulted in exceedences of the annual average for nitrogen dioxide (NO₂) and fine particulates (PM₁₀).

It is recognised that improving air quality in these specific locations is difficult due to the increased use and reliance on private motor vehicles.

The Air Quality Strategy is a high level guiding document to inform policy and direction across a range of council services with the aim to improve air quality.

The main aim of the strategy is that

‘Wiltshire Council working collaboratively will seek to maintain the good air quality in the county and strive to deliver improvements in areas where air quality fails national objectives in order to protect public health and the environment’

Delivering improvements to local air quality requires input from a wide range of planning and other professions. The Air Quality Strategy is a key document which identifies the importance of good air quality to the people of Wiltshire. It provides a focus and mechanism to promote communication and cooperation within Wiltshire Council, between external organisations and with the community to address localised areas of poor air quality in the area. It includes a 17 point plan which focuses on strategic actions to help deliver improved air quality. Detailed proposals on how to address site specific air quality issues are contained in existing Air Quality Action Plans (AQAP) which will be updated and consolidated as part of the implementation of this strategy. The new Wiltshire AQAP will be produced and submitted to Defra in the early part of 2012.

1 Introduction

1.1 The importance of air quality

The ability to breathe clean air and air that is not harmful to health is assumed to be a fundamental right of the UK population.



Where air quality is poor there are proven short and long term impacts on human health and the surrounding environment. Air quality is also important in how people perceive their environment and the desirability of visiting or living in an area. For example the quality of the air was a key consideration at the Beijing Olympics in 2008 and has been raised as a possible concern for the London Olympics in 2012.



The health impacts of polluted air are recognised and were ably demonstrated by the great London smogs of the late 19th and early 20th Century. The worst of these events were shown to be responsible for many thousands of excess deaths.

These historic smogs were caused by the large scale burning of coal and wood and were a highly visible and obvious example of air pollution and its health effects.

Changes in the law and improved technology have significantly reduced obviously visible air pollution and changed the constituents found in polluted air.

Many of the current pollutants are invisible to the eye but act as respiratory irritants. This is particularly problematic if individuals have a pre-existing medical condition or vulnerability. Poor air quality continues to have significant impact on the health of the UK population and on the UK economy.

In 2010 the House of Commons Environment Audit Committee estimated that the health costs of air pollution in the UK as being in the region of 8 to 20

billion pounds per year, with as many as 50,000 premature deaths per year.

The importance of good air quality has been recognised by the World Health Organisation which produced a series of standards that have been adopted by the European Commission and subsequently the UK by the Expert Panel on Air Quality Standards (EPAQS) which has set air quality objectives for the UK.

1.2 Clean air in Wiltshire

The air quality in Wiltshire is predominantly very good with the majority of the county having clean unpolluted air. There are however a number of locations where the combination of traffic, road layout and geography result in pollutants being trapped so that the concentrations increase to unacceptable levels.

The relatively few locations where Wiltshire may fail to meet the national standards have to be investigated and sampled in order to determine the true extent of the problem. If significant pollution is identified the council has to declare an Air Quality Management Area (AQMA) and put plans in place to seek to improve the air quality.

The ageing population, requirements for new housing and essential development across Wiltshire have the potential to increase the number of people living and working in areas with poor air quality and it is important that Wiltshire Council takes steps to manage this situation to minimise or eliminate possible harm.

1.3 The aims of the strategy

This air quality strategy is a key document which identifies the importance of good quality air to the people of Wiltshire. It also provides a focus to implement more effective cross-departmental collaboration and communication. The overriding aim of the air quality strategy is to protect public health.

‘Wiltshire Council working collaboratively will seek to maintain the good air quality in the county and strive to deliver improvements in areas where air quality fails national objectives in order to protect public health and the environment’

The adoption of this strategy is a key step in the development of an updated Air Quality Action Plan (AQAP) for Wiltshire.

The publication of the AQAP is a legal requirement and the document identifies the specific steps and actions necessary to secure measurable improvements in areas of Wiltshire where air quality concerns have been identified, and sets a timetable for achieving these improvements.

1.4 Contents of the Air Quality Strategy

The strategy consists of eight sections and their supporting appendices. These sections and their purpose are outlined below:

Section 1: Introduction

This section sets the issue of air quality in to a historic and local context.

Section 2: The regulatory framework for air quality

This outlines the development of current air quality legislation and the direct link to national and international frameworks. The list of pollutants of concern is included in this section.

Section 3: Scope of the air quality strategy

This section outlines the overall scope of the strategy and specifies certain aspects that are excluded from consideration.

Section 4: Wiltshire in context

This section discusses, in general terms, air quality levels for Wiltshire and which pollutants are routinely monitored and why. There is also a brief discussion of the Air Quality Management Areas which have already been declared.

Section 5: Improving air quality

An interpretation of some of the air quality monitoring to date is included in this section of the document. Some lessons learned from the last decade are also identified and discussed.

Section 6: Identifying common themes

This part of the document identifies the links to other key strategies and departments and suggests an improved methodology to deliver outcome focused improvements to air quality.

Section 7: Strategic Actions

A summary of the key issues identified in the strategy and the actions and activities that need to be undertaken to deliver clean air throughout Wiltshire.

Section 8: Conclusions

This details the way ahead and includes a strategic action plan.

Appendices:

Supporting and explanatory information has been provided in a number of annexes to the main document.

2 The regulatory framework for air quality

2.1 International and national drivers

Air quality has been identified as important to human health and wellbeing for many years. In addition it has a range of occupational, environmental and economic impacts. As a consequence there has been a great deal of research carried out and a number of international and national bodies have issued guidance and advice.

At the development of recommendations on ambient air quality and their incorporation into UK law can be traced back through the European Commission and World Health Organisation. This has led to the adoption of robust internationally recognised standards.

The following section summarises how the current UK regulations have been developed into the current regulatory framework for air quality.

2.2 International drivers for air quality

The World Health Organisation (W.H.O) has commissioned a significant amount of research into the health impact of poor air quality. On the basis of this research it has produced recommendations on a range of pollutants.

The W.H.O. recognised that there are significant differences between various world regions and that relevant pollutants would vary between regions. The advice it provides is therefore tailored to specific regions, identifying pollutants that are of particular concern. It has issued recommended standards applicable to the European arena focusing on seven key pollutants.

The European Commission (E.C) has considered and accepted the World Health Organisation proposed levels and consequently incorporated these standards into E.C law via a number of European Directives. The most current of these is the Ambient Air Quality Directive (2008/50/EC). This directive can be obtained from the Europa Website (http://europa.eu/index_en.htm).

These directives instruct member states to implement legislation to impose the standards and once a directive has been issued the member states have to implement the requirements via their own national legislative frameworks.

2.3 Development of air quality legislation in the UK

In the case of the UK, the requirement to manage and improve local air quality was incorporated into the Environment Act 1995. The supporting air quality regulations and guidance were subsequently issued by the Department for Environment, Food and Rural Affairs (Defra).

This legislation imposes a duty on Local Authorities to inspect their areas to identify areas where local air pollution may be a problem and where necessary, to measure and assess the levels of pollution in those areas.

The legislation and guidance specifies which pollutants are to be considered and how they are to be assessed or measured. If a significant failure of the air quality standard is found the Local Authority has to declare an Air Quality Management Area (AQMA) and take steps to try to reduce the levels of pollution.

In addition to the local authority monitoring, Defra also established a series of national monitoring stations at key locations around the UK to provide a nationwide overview of air quality.

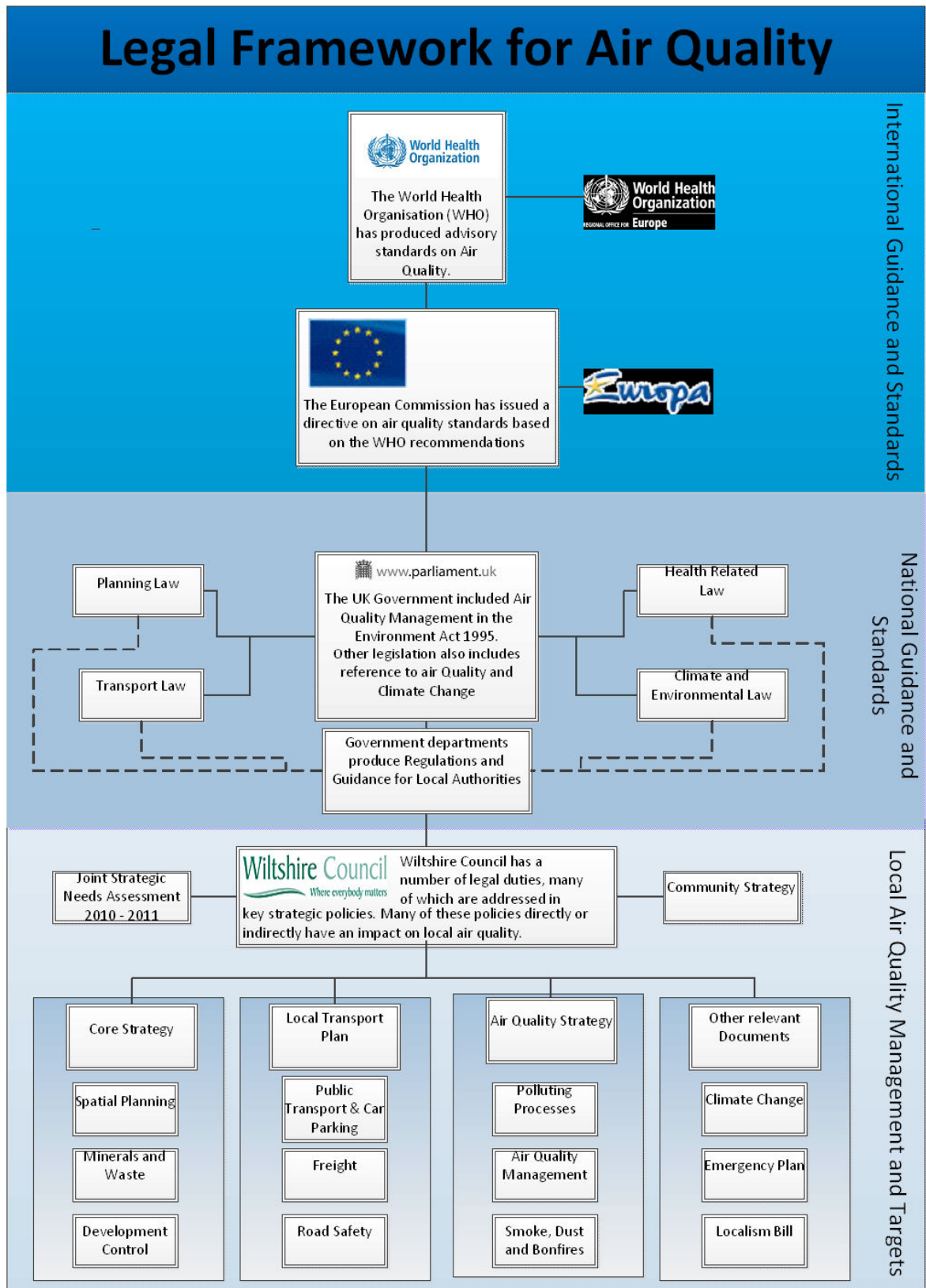
2.4 Related legislation and activity

Whilst the driving legislation behind the air quality strategy is the Environment Act there are a range of other activities and duties carried out by Wiltshire Council which directly and indirectly have an impact on the ambient air quality. These include Transport and Highways, Spatial Planning, Development Control and Climate Change.

Many of these areas of work have specific duties to consider air quality as part of their own remit and supporting strategies. Additionally it is likely that the majority of air quality improvements will be obtained via planning or highways intervention. It is therefore critical to identify these areas of mutual interest.

Figure 1 includes a summary of the information outlined above.

Figure 1 Summary of legal framework



2.5 Possible pollutants of concern

The World Health Organisation identified seven key pollutants as being of possible concern and has set target level against which they may be assessed. A summary of these is given in figure 2 with more comprehensive information on target levels and possible health effects included in appendix 1. In Wiltshire only nitrogen dioxide (NO₂) and fine particulates (PM₁₀) are of concern (see section 4.3).

Figure 2 Pollutants to be assessed

Pollutant	Source of Pollution
Benzene	Unburnt fuel in petrol vehicle exhausts and fuel evaporation during refuelling and industrial solvent use.
1,3-Butadiene	Formed during the combustion of petrol and diesel. Industrial chemical plant and the manufacture of synthetic rubber tyres
Carbon Monoxide	Incomplete combustion of fuel
Lead	Industry
Nitrogen Dioxide	Nitric oxides derived predominantly from motor vehicles but also from other combustion and power generation processes.
Fine particles (PM ₁₀)	Wide range of natural and manmade sources major local sources include Road traffic - combustion, brakes and tyres. Erosion of soils, agriculture and quarrying
Sulphur Dioxide	Produced when sulphur containing fuel burned. Major source in UK is power stations

Carbon dioxide (CO₂), a commonly quoted air pollutant, is notably absent from the above list. It is not included in the above table because whilst having climate change impacts it does not affect respiration directly.

Transport related CO₂ emissions are identified as a priority in a number of other strategies and given that transport is a major source of CO₂ it is reasonable to believe that steps taken to improve local air quality will also have an impact on these other strategic aims.

3 Scope of the air quality strategy

3.1 Limitations of the strategy

The Air Quality Strategy is a high level guiding document to inform policy and direction across a range of council services with the aim to improve air quality.

It is important to specify the scope of this strategy and other areas of common interest. A key role of this strategy is to enable more collaborative working between departments, agencies or other organisations which have a common interest in maintaining or improving air quality. Many of the common strands of the applicable legislation and strategies require a more 'joined' up and integrated approach.

As a result of the consultation and joint working proposed within this document it is envisaged that improvements in communication and the delivery of outcomes in a shorter time should be achievable.

Not all aspects of air pollution are addressed in this strategy. Air pollution which is controlled under occupational health or civil contingencies legislation is not addressed, nor is the issue of indoor air quality in residential accommodation.

Figure 3 below summarises a number of key air quality exposure routes and their relevance to this strategy.

Figure 3 Scope of the strategy

Description	Controls	Links to Wiltshire Council
Climate Change	Usually focused on CO ₂ and overall National Emissions	<p>Wiltshire Council does have policies and responsibilities to minimise carbon emissions and waste management etc.</p> <p>Some links with the strategy as many of the aims of managing / reducing vehicle traffic overlap.</p>
National Air Quality Standards	<p>Targets set by European Legislation.</p> <p>National Monitoring Framework to which local air quality contributes</p>	<p>Indirect links to Planning Policy, Transport Policy & Climate Change Policy.</p> <p>The air quality strategy and annual reports contribute to the national assessments.</p> <p>Not specifically relevant to the local strategy but there is clear link in the national interpretation of our locally produced data.</p>
Local Air Quality Management	National Targets adopted by Defra / U.K Government	<p>The air quality strategy and use of AQMAs contribute to the protection of public health at a local level.</p> <p>There are clear links to transport policy, transport planning, strategic planning, and development control.</p> <p>Clear links to the local demographic trends and predictions for increased car ownership</p> <p>Clear links to the construction and location of new housing and commercial or industrial developments.</p> <p>This area of work is the core of the local air quality strategy requirements.</p>
Potentially polluting industry, activity/process	Controlled by Pollution Prevention and Control Act 1999	<p>Potentially polluting processes identified in guidance issued by Defra. Includes activities such as stone crushing, crematoria, vehicle spraying, timber cutting, landfill and others.</p> <p>Their emissions are managed by a permitting system operated by the Wiltshire Council and the Environment Agency.</p> <p>There are some potential links with the air quality strategy particularly in terms of possible PM₁₀ emissions.</p>

4 Wiltshire in context

4.1 The air we breathe

When considering air quality and health impacts it is important to view the matter in the local context.

Wiltshire consists of large areas of agricultural or military land with a few large settlements such as Salisbury, Trowbridge and Chippenham with a greater number of smaller settlements and villages. It is a green and relatively undeveloped area and consequently the air in Wiltshire is clean and the quality very good.

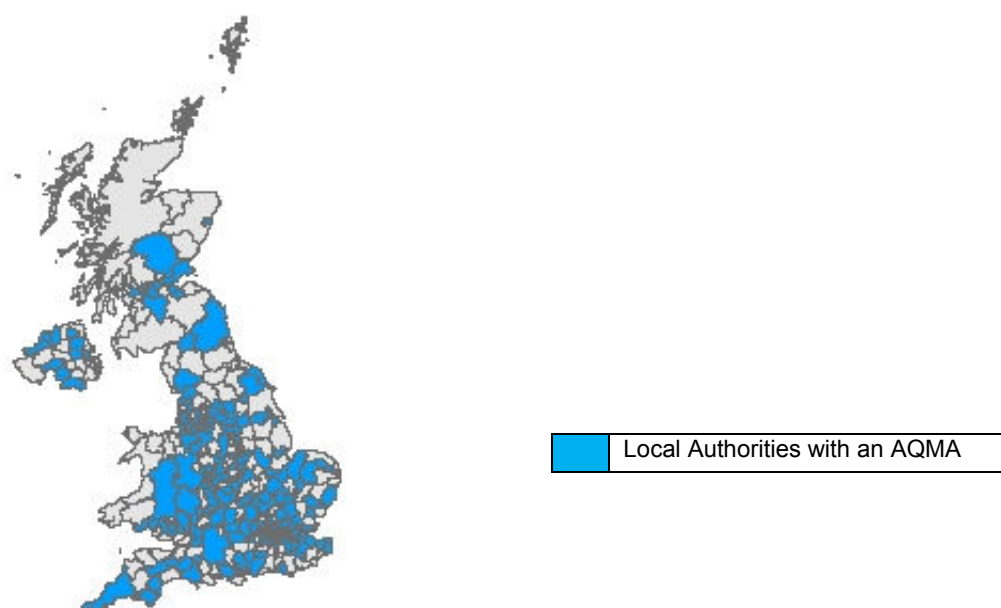
A small number of locations have been identified where air quality falls below the required standards. In these locations further investigation is needed and in some an Air Quality Management Area (AQMA) may need to be declared.

In a very small number of locations the air quality is known to significantly fail guidance standards and here the council has a duty to try to improve matters.

It is difficult to make direct comparisons with other local towns and cities as populations, road networks and topography all vary significantly. However to give some perspective the city of Bath has 20 sites where the annual mean for NO₂ exceeds 50 µg/m³, where Wiltshire has eight such sites.

In the UK 311 AQMAs had been declared by 2010.

Figure 4 Local Authorities with AQMAs

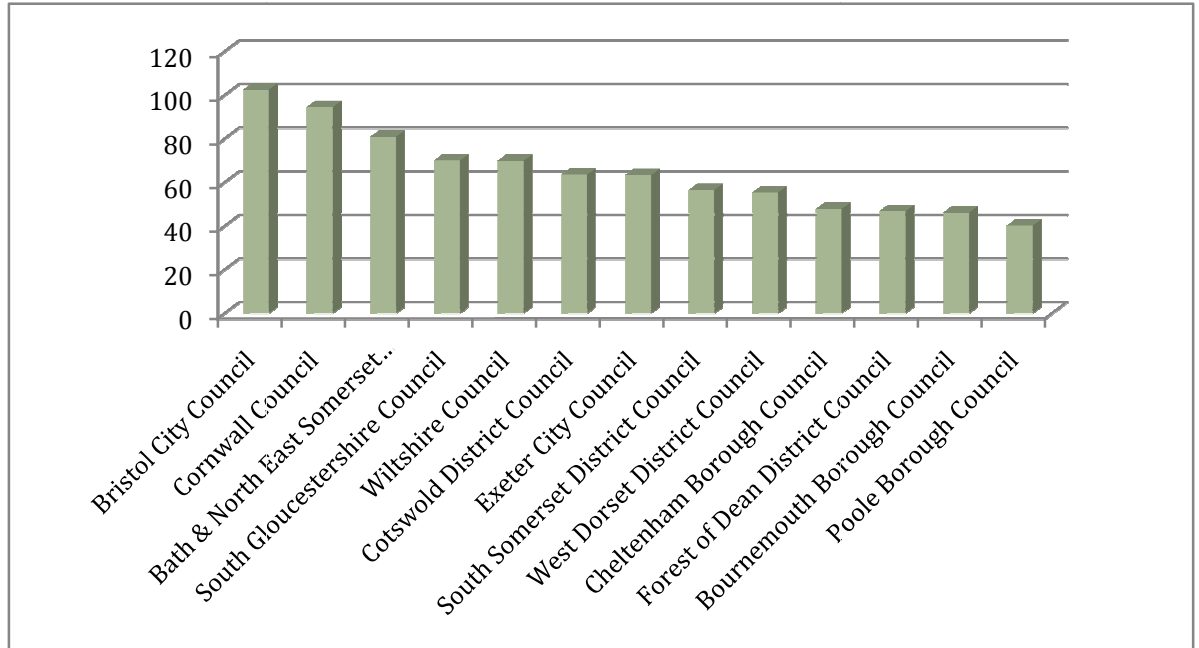


Selection of Comparison Authorities

In terms of air quality targets the EC considers the UK as 43 separate agglomerations or areas. Wiltshire is part of the South West Area.

This area includes a large number of authorities, including Bristol and Bath.

Figure 5 Highest NO₂ readings from diffusion tubes in 2010 within the South West



Tube readings 2010

The highest levels of NO₂ recorded by diffusion tubes in Wiltshire occur in Bradford on Avon. In 2010 the annual average NO₂ figure was 70µg/m³. The graph in figure 5 shows how this high level compares to others in the South West Agglomeration. Wiltshire is ranked 5th in the South West. Clearly if other areas outside the South West were included Wiltshire's position is likely to fall.

Air quality in Wiltshire is very good. This is perhaps unsurprising given the rural nature of much of the land within its boundaries. The areas of concern are generally very specific and localised.

4.2 The air quality assessment process

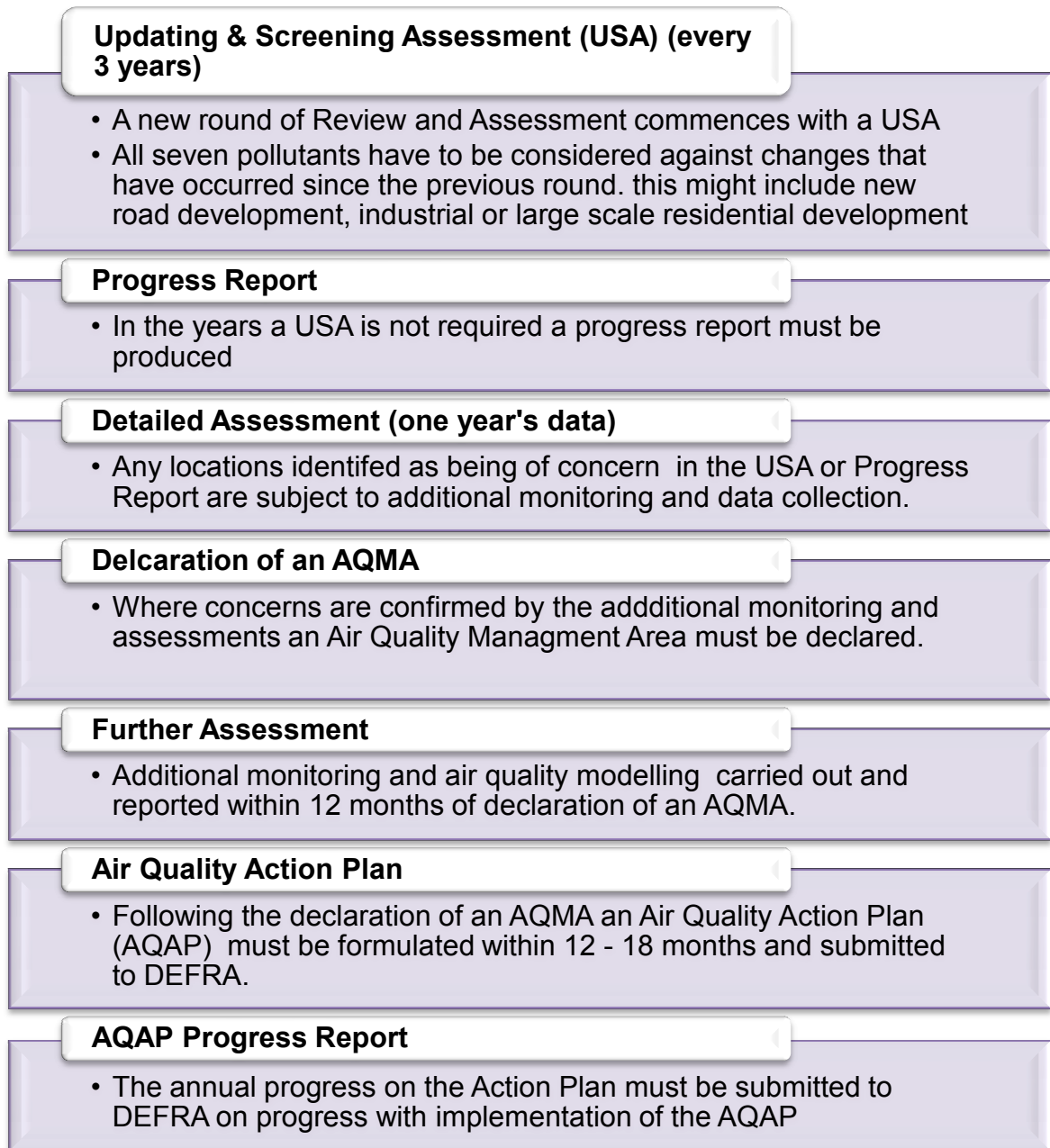
Defra has produced a range of guidance for local authorities outlining how the matter of local air quality should be addressed. The guidance identifies which pollutants are to be considered, and how the stages of assessment should be carried out.

This national approach is summarised in the flow diagram shown in figure 4 below.

Wiltshire Council has complied with this multi stage approach and has currently identified seven specific locations where air quality is of concern and AQMAs have been declared. These are in Westbury, Bradford on Avon, Devizes, Marlborough and three in Salisbury.

Maps showing the extent of these areas are included in appendix 2.

Figure 6 Air quality assessment process



4.3 Pollutants of concern in Wiltshire

The air quality regime has been in place for over a decade and the initial scoping and assessment process has been carried out a number of times in different sites across the county. As a result it has been determined that of the seven pollutants of concern only nitrogen dioxide (NO₂) and Particulates (PM₁₀) are likely to be of significance at the locations already considered. These pollutants are directly linked to traffic.

The remaining five pollutants either have no significant local source or past monitoring has demonstrated that the levels are minimal. Benzene and 1,3 Butadiene monitoring for example have been carried out at a number of sites across Wiltshire but no significant levels were detected.

The decision to exclude these five pollutants is common across the UK with only 3% of the 311 local authorities which have an AQMA including the assessment of any other pollutants. (2010 figures)

Figure 5 below includes the list of all seven pollutants, their target levels and highlights the remaining pollutants of concern.

Figure 7 Pollutants relevant to Wiltshire

Pollutant	Objective	Relevant in Wiltshire
Benzene	5 µg/m ³ (annual mean)	No
1,3 Butadiene	2.25 µg/m ³ (annual mean)	No
Carbon Monoxide	10 µg/m ³ (8 hour mean)	No
Lead	0.25 µg/m ³ (annual Mean)	No
Nitrogen Dioxide	40 µg/m ³ (annual mean) 200 µg/m ³ (hourly mean)	Yes
Particulates (PM ₁₀)	40 µg/m ³ (annual mean) 50 µg/m ³ (24 hour mean)	Yes
Sulphur Dioxide	125 µg/m ³ (24 hour mean) 266 µg/m ³ (15 minute mean) 250 µg/m ³ (1hour mean)	No

A more comprehensive table is included in Appendix 1.

4.4 Measurement techniques

Nitrogen dioxide and particulates can be monitored in a number of ways but in order to satisfy the requirements of Defra, Wiltshire Council has to utilise the nationally approved techniques and methodologies.

Details of these methodologies and how the data is processed are included in Appendix 3.

To ensure statistical validity all air quality results are assessed on the basis of a full 12 months' data. This is because it is common for there to be seasonal or weather related variations in recorded levels which could allow false conclusions to be reached if only short term measurements are considered.

Additionally it is necessary to adjust the diffusion tube readings at the end of the year, in line with statutory guidance, to ensure that the results are representative. This can only be done once the bias adjustment is calculated using a full year of both the tube and automatic monitoring results.

The bias adjustments are calculated by a Defra specified agency and the results are typically issued by March each year. Monitoring is carried out January to December and the corrected results are therefore not available until March/ April the following year.

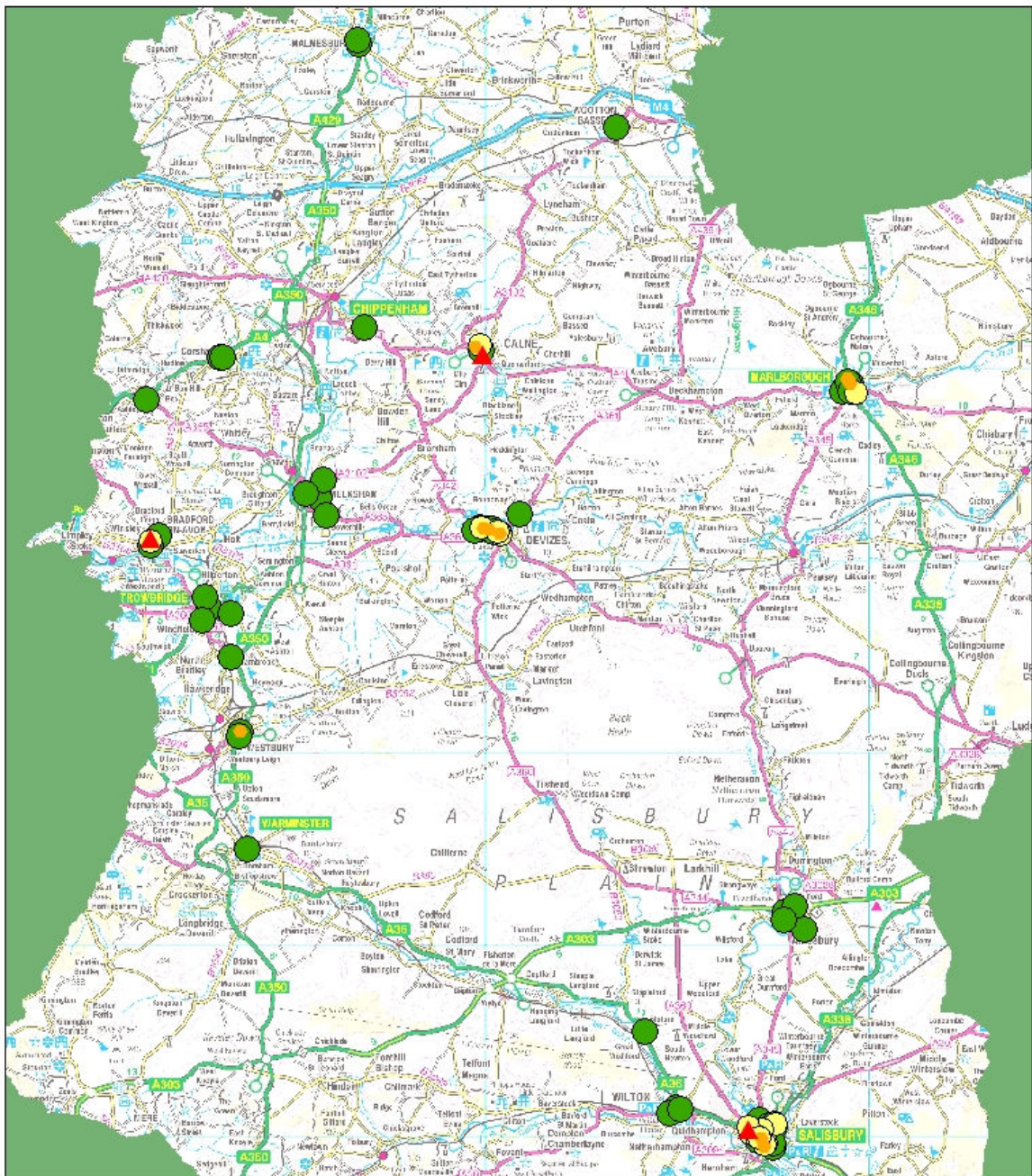
Similarly if a new site is located and diffusion tubes or automatic monitoring are installed the information will not be available for analysis for a full year after the initial installation date.

There is always a delay of a year or more from when monitoring commences to the availability of the results.
Even "new" data will be a year old.

Figure 6 below shows the location of nitrogen dioxide tubes in 2010 and demonstrates where the air quality standards are met or fail.

It should be noted that tubes are generally located where air quality is anticipated to be poor. It is therefore encouraging that such a high percentage of the tubes still demonstrate compliance with the air quality standards.

Figure 8 Map showing Diffusion Tube Locations



**Nitrogen Dioxide Tube Results 2010 -2011
All Results in $\mu\text{g}/\text{m}^3$**

- 20 - 39 Meets standard
- 40 - 44 Marginal Failure
- 45 - 59 Failure
- ▲ 60 - 70 Significant Failure

4.5 Data in Wiltshire

Figure 7 below summarises Wiltshire's tube results for 2006 to 2010 and demonstrates that although these are 'worst case' locations a significant number of the tubes are still below the $40 \mu\text{g}/\text{m}^3$ standard meaning that the air quality can be considered good.

The graph shows that in the period 1 January 2006 to 31 December 2010 the number of 'good' tubes fluctuated between 62 and 82%. Note that although the number of 'good' tubes appears to have decreased from 82% to 62% between 2009 and 2010 this is because a number of tubes were relocated to allow new or additional monitoring to be undertaken. It cannot be construed as showing that air quality in Wiltshire has worsened in that period.

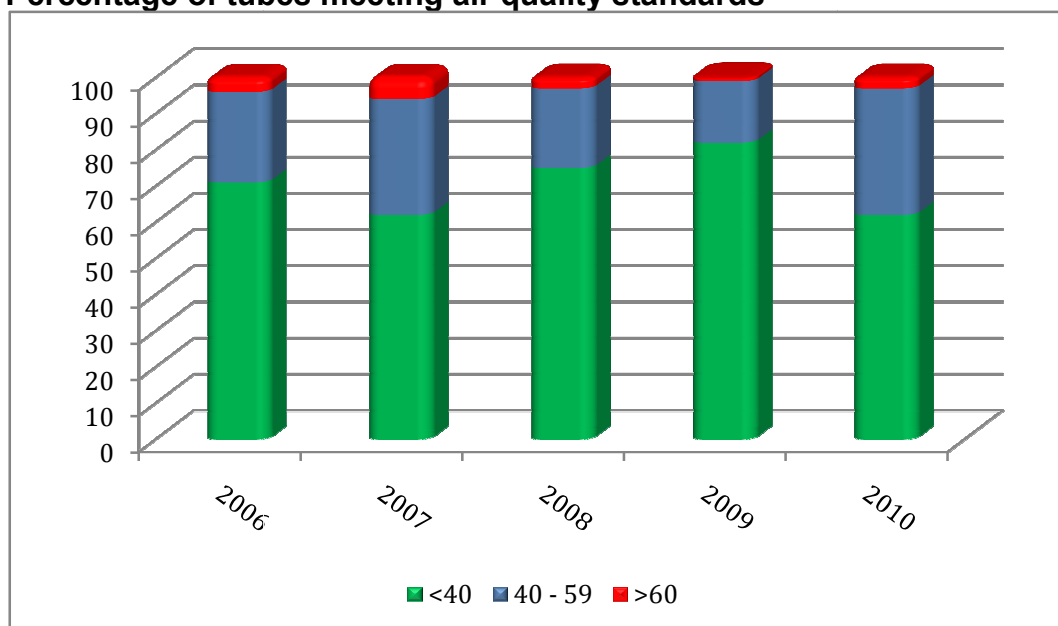
The number of tubes failing to meet the $40 \mu\text{g}/\text{m}^3$ standard has varied between 17 and 35% demonstrating that a number of locations do need further investigation and assessment.

Of most concern are the tubes returning an annual average of $60 \mu\text{g}/\text{m}^3$ or above. Defra guidance identifies these tubes as being in locations where the more significant hourly means of $200 \mu\text{g}/\text{m}^3$ may be being exceeded. These locations require additional investigation using automatic analysers.

Notably only between 1-6% of the locations across Wiltshire are recording levels in this region.

Figure 9 Graph showing Diffusion Tube Results

Percentage of tubes meeting air quality standards



5 Improving air quality

5.1 Air quality achievements to date

This strategy aims to support improvements in local air quality and to protect human health, quality of life and the environment. As a result of the primary legislation driving its creation the focus in Wiltshire is on nitrogen dioxide and particulates.

The past focus has been to comply with the Defra requirements in identifying possible sites, monitoring, declaring and the identifying improvements. This has been successfully undertaken, but in areas where there are issues with NO₂ and PM₁₀ the improvements delivered across Wiltshire has been relatively modest.

The increase in car numbers nationally has diluted the associated improvements in air quality due to better car technology. Certainly there is little evidence in the monitoring data to demonstrate that the technological changes have made a significant difference.

Given that the key pollutants in Wiltshire are known to be primarily traffic related there is an obvious link to both the planning and highways authorities.

Case Study 1. Salisbury

In 2003 four Air Quality Management Areas were declared in Salisbury. In 2005 the Salisbury Transport Plan 1 was adopted as the Air Quality Action Plan for the city. The introduction of park and ride schemes, combined with smart traffic management reduced the amount of traffic entering the city with a subsequent improvement in air quality.

Whilst a small number of locations show some increase in NO₂ there is an improving trend in NO₂ levels at most locations.

Salisbury has a significant number of bus services in a localised area and the introduction of particulate traps to the public transport fleet has reduced the PM₁₀ emissions by 35%.

The success in Salisbury indicates that improvement to local air quality will rely heavily on appropriate traffic and demand management measures to reduce reliance on the car and to encourage the use of sustainable transport alternatives.

5.2 Recognising the need for a thematic approach

An analysis of Wiltshire's strategic documents indicates that there are a number of common themes relating to economic development, transport, climate change and air quality.

Additionally it is recognised that there needs to be a move away from a measure and react strategy to an outcome focused, goal oriented approach.

This realisation combined with the assessment of the data gathered over last ten years has allowed a number of overarching requirements to be identified. These are summarised in figure 8 below.

Figure 10 Priorities for improvements to air quality

Priorities for a successful air quality strategy	
1	To protect public health.
2	To focus and prioritise available resources where air quality does not meet standards and improvements are possible.
3	To focus on outcomes and the achievement of improved air quality in areas where air quality does not meet standards.
4	To maintain and protect air quality where it is currently good.
5	To work collaboratively with others who have similar concerns and objectives.
6	To design improvement schemes that meet the requirements of the community they serve.

5.3 Key influences on air quality in Wiltshire

The common factor in managing air quality in Wiltshire is the motor vehicle. In practice managing transport system, vehicle movements and the location of new developments will be the primary method of improving or maintain air quality.

Figure 9 includes four aspirational steps which would deliver significant improvements. The practicalities involved in making these changes present a significant challenge in the future.

Figure 11 Four key ways to improve air quality

Four methods to improve air quality	
1	Implement appropriate measures to manage traffic flows and congestion near identified sensitive locations.
2	Promote and encourage the greater use of sustainable transport alternatives.
3	Lobby government and the motor industry to introduce new

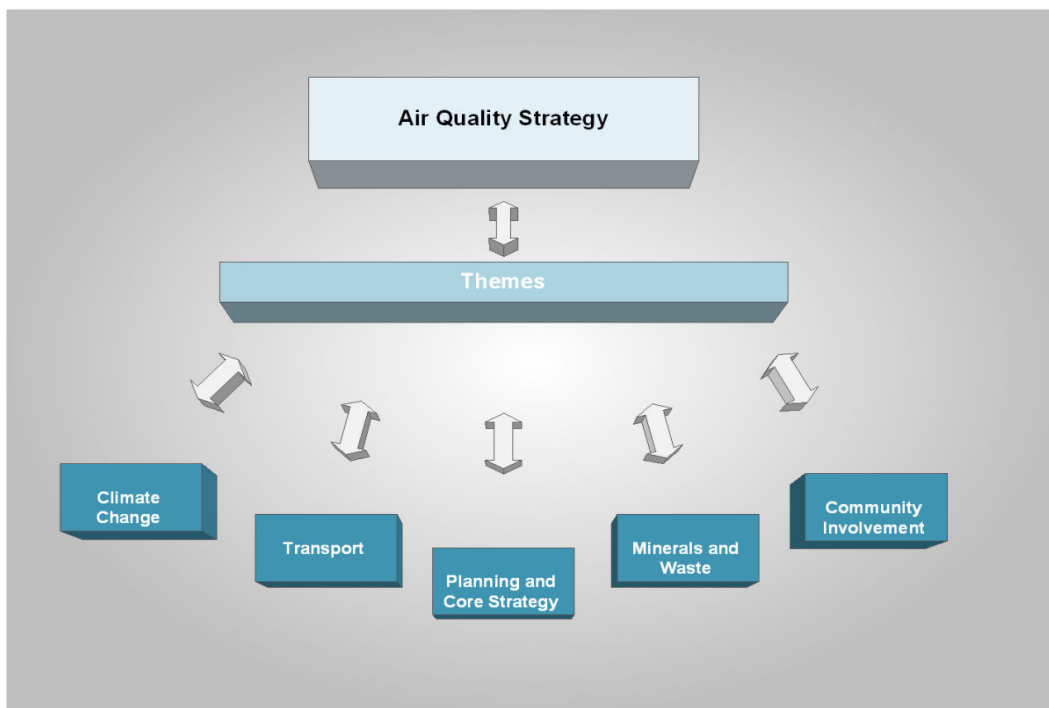
	infrastructure and technologies such as a network of electric car charging points and greener engines.
4	Engage and work with local communities to encourage them to support required measures and make beneficial behavioural changes.

6 Identifying common themes

6.1 Common strategic aims

The impacts of poor air quality have been considered and possible common areas of influence identified. These have been mapped to existing departmental functions and their supporting strategic documents. A number of common themes have emerged. Figure 10 gives a graphical representation of a number of these links and the possible relationship to the air quality strategy.

Figure 12 Common Themes in Wiltshire Strategies



A more detailed consideration of their individual key strategic objectives has been carried out and possible links to local air quality management identified. These are summarised in figure 11. Where possible the strategic aim from the appropriate strategy document has been identified. In other cases there are references in the documents' text which imply a link but there is not necessarily a specific strategic aim which can be quoted.

Figure 11 demonstrates that there are a significant number of linkages between these key strategic documents and the requirements of the air

quality strategy and the strategic objectives described in section 7.1 below. Given these areas of common interest it is likely that relevant improvements achieved by any one of the strategies will have an advantageous impact on all the others, including the air quality strategy. On this basis collaborative working appears to be essential.

6.2 Funding of improvements

The identified linkages are particularly important in the context of the air quality strategy because there is no specific funding available for the identified improvements under the air quality legislative framework. It is possible to bid for limited funds from Defra but the opportunities and amounts available are hard to predict in the current financial climate.

Clearly a bid for a specific project will be made should the opportunity arise, but in practice the funding for changes will come from other sources. These sources are predominantly likely to be highways improvement or planning development related, such as the Community Infrastructure Levy.

For this reason it is critical to identify common areas where the shared strategic aims can be achieved by any proposed changes or developments.

Based on the linkages identified the whole approach to managing and delivering improvements to air quality has been reviewed. The strategic objectives have been refocused to provide outcomes based on joint working and overlapping targets. The new focus is intended to be outcome and achievement based with measurement taking place to support the strategy rather than driving it.

Figure 13 Table of Strategic Links

Specific aims from the strategies	Wiltshire Council strategies				
	Local Transport Plan	Energy Change and Opportunity Strategy	Wiltshire Core Strategy	Community Plan	Joint Strategic Assessment
Reduce carbon emissions	✓ SO10	✓	✓ SO1	✓	✓
Sustainable transport alternatives	✓ SO10	✓	✓ SO8	Yes	✓
Reduce level of air pollutants and climate change emissions	✓ SO10	✓	✓ SO1	Yes	✓
Support planned growth in Wiltshire	✓ SO10	✓	✓ SO5		✓
Reduce impact on quality of life and built and natural environment	✓ SO4	✓	✓		✓
Reduce need to travel by private car	✓ SO10	✓	✓ SO8		✓
Efficient freight movements	✓ SO10				
Develop school transport plan	✓ SO10	✓			
Ease congestion and hotspots	✓ SO1				
Carbon management plan for Council's emissions		✓			
Development of infrastructure to support health and wellbeing of community			✓ SO10		✓
Delivery of housing		✓	✓ SO4		✓
Increased use of low emissions vehicles		✓			
Minimise traffic delays and disruption	✓ SO2				
Support economic growth	✓ SO10	✓	✓		✓

7 Strategic objectives

7.1 Development of objectives

Ten strategic objectives have been identified as part of the development of this strategy. These are shown in Figure 12. It is recognised that to make any significant improvements in areas of poor air quality an outcome focused approach is required and working in conjunction with a wide range of other departments and groups is essential. A number of the strategic objectives which have been identified are closely linked and interdependent.

Figure 14 Strategic Objectives

Reference	Strategic Objective
SO1	Secure improvements to existing Air Quality Management Areas
SO2	Implement a prioritisation system to manage and schedule proposed improvements to existing air quality management areas
SO3	Implement a prioritisation system to manage the investigation of new sites
SO4	Maintain or improve air quality in areas currently meeting the statutory standard.
SO5	Improve interdepartmental working on common strategic objectives with an outcome focused approach.
SO6	More efficient use of equipment and resources.
SO7	Community and Area Board involvement in the air quality management process
SO8	Provide high quality information and guidance on air quality. This will be made available to the council, the public and developers.
SO9	Provide improved mapping layers and data via the corporate graphical information system (GIS) to identify current and potential air quality management areas.
SO10	Support planned economic growth, sustainable transport alternatives and reductions in climate change emissions

7.2 Securing improvements in existing Air Quality Management Areas (AQMA's) (SO1)

There are seven Air Quality Management Areas declared within Wiltshire (shown in Appendix 2). These have been declared because monitoring has indicated that they consistently fail the 40 µg/m³ target levels specified for Nitrogen Dioxide (NO₂) by the World Health Organisation and the UK Regulations.

In practice the levels of pollutant exposure will vary significantly between these areas as will the number of people affected. Some locations may be easier to improve than others for technical or financial reasons and some locations may already be scheduled for road improvements as a result of planned highways works or local development.

In locations where no changes are planned or likely, it will be necessary to identify a method by which improvements will be made. This will require joint working between a number of departments, agencies and community representatives. As a consequence this is likely to have a significant resource implication and any proposals will need to be built into the various departmental budgets and strategic work plans.

7.3 Prioritisation of air quality improvements (SO2)

It is not feasible to look at all the locations at one time due to resource and funding restrictions. Consequently it will be necessary to develop a prioritisation system which can be agreed between the various departments and organisations so that the most significant risks can be dealt with as quickly and efficiently as possible.

The need to agree a joint prioritisation system for existing AQMA's is a key objective of the air quality strategy.

There are also a number of sites which will be under investigation each year. If these are found to have pollutant levels above the specified standards further AQMA's may have to be declared. These should then be considered using the same prioritisation matrix and the work plans adjusted according to the findings.

7.4 Prioritise new sites for investigation (SO3)

Wiltshire Council has a duty to undertake periodic reviews of the area in order to identify any additional locations where air quality may not meet the national standards.

This type of assessment is carried out using the principles specified in the Defra guidance and utilises a range of data sources including traffic

flow and congestion information, the location of new or proposed developments, local knowledge and topography.

The review incorporates all of the seven pollutants identified by the World Health Organisation and must take account of any new industrial processes or possible pollution sources.

If the review identifies any locations which are likely to fail one of the standards the council has to carry out monitoring using appropriate methodology.

However in practice there are resource and budgetary constraints which are likely to mean that not all sites may be monitored in the same financial year.

Where multiple sites have been identified or where a local community has expressed concerns regarding the air quality it will be necessary to prioritise the order in which sites are investigated.

7.5 Maintain or improve current air quality (SO4)

There is a legal obligation to improve air quality in areas of Wiltshire which fail to meet the air quality standards, but it is equally important to ensure that the rest of Wiltshire is protected and that the general high standard of air quality is maintained.

The most effective way to maintain existing standards and to seek improvements is by collaborative working across departments in the council.

7.6 Improved collaborative working (SO5)

Wiltshire council has identified a need for significant economic development and house building across the county. The process will be managed by a combination of the core strategy and spatial planning.

Additionally the minerals strategy has identified the need for additional mineral extraction, particularly sand and gravel, in various locations around Wiltshire.

Such development has the potential to increase localised air pollution or to place additional strains on the highway system. Whilst in many locations development may take place with little significant impact on local air quality there is the potential that in other localities development may exacerbate an existing air quality problem or produce enough additional traffic related pollution for a new area to fail the prescribed standard.

This is clearly the best stage for air quality issues to be identified as many potential air quality impacts can be ‘designed out’ if considered early enough in the process. Some examples of this approach are included in figure 13 below.

Figure 15 Advantages of timely intervention in the planning process

Issue	Solution	“Before” cost	“After” cost
Property close to busy or congested road (exposed to high pollution levels)	Include landscaping, bunding or separation to increase distance from highways and junctions	Decreased if part of initial design	Potentially prohibitive if late in design process.
Impacts of additional traffic on existing highways system	Possible traffic management or highway improvements funded through planning system	Decreased if part of initial design	Potentially prohibitive if late in design process.
Generation of pollution from industrial activity (possible additional to NO ₂ or PM ₁₀)	Abatement technology and incorporating site layout / separation and other conditions in planning process	May still be high but allows for proper site selection	Likely to be higher if late in process or retrospectively fitted.
Particulate generation from quarry activities or associated traffic	Traffic routing, site management, site layout and phasing	Decreased if part of initial design	Potentially prohibitive if late in design process.
Community concerns over the potential impacts	Accurate information. Increased public involvement increase confidence in proposed solutions	Unknown but can be time consuming and decrease possibility of project going ahead	Likely to be reduced costs, less unnecessary opposition and better public profile for developer

7.7 More efficient use of resources (SO6)

The use of large numbers of diffusion tubes as a way of measuring nitrogen dioxide is efficient and cost effective. Tubes are relocated as necessary to enable additional or new sites to be measured without increasing the cost to the council.

The automatic monitoring stations are substantially more expensive costing between £30,000 - £40,000 to initially purchase and with substantial ongoing maintenance and calibration costs of around £5,000 a year.

These machines are used where more accurate assessment is needed but in some cases they are located on sites where the recorded nitrogen dioxide levels or particulate levels are very low. These machines can be re-sited as necessary to minimise the need for additional purchases and to maximise the benefits gained from their use.

Additional consideration should also be given to the use of shorter term monitoring at sites where higher exposure levels are suspected using hired equipment. This would maximise the ability to gather useful information whilst minimising costs.

Some of the existing automatic monitors are now nearly ten years old and consideration should be given to replacing them on a planned basis. This could also include the possibility of incorporating remote data downloading in order to reduce operator and travel costs further.

In order to screen sites for possible air quality impacts both in terms of planning and development and in terms of air quality assessment it is necessary to bring together a number of data sources. These include road and highways data, mapping and address information, topography, wind direction and traffic information. Historically this information has been separate but the implementation of the new corporate graphical information strategy should enable the easy access and sharing of such information.

This strategy supports the principle of making all air quality related data available as a shared layer on the mapping system for use by other departments as necessary.

7.8 Improved public engagement and consultation (SO7)

In order to develop schemes which improve local air quality it is vital to involve the local communities. Solutions to improve air quality need to be creative and well thought out schemes that fulfill all of the technical criteria. This will clearly include working closely with highways and planning officers.

Schemes should be acceptable to the communities they are designed to help. In order to facilitate this local communities and Area Boards will be invited to contribute to proposed schemes of work early in the process.

Due to the difficulty in obtaining complete agreement it is envisaged that, where possible, a range of options will be presented from which the most acceptable can be chosen. At the end of the development and consultation period a scheme will be selected for implementation.

Local residents and highway users are both key to delivering improvements in local air quality. Residents need to be involved in the development of schemes to reduce air pollution levels, and both they and the local democratic process are vital in agreeing and implementing successful control measures. The localism agenda now puts greater emphasis on this issue, and may introduce potential tensions where schemes are required to reduce traffic related pollution, but such schemes are not acceptable to local communities. This may result in solutions to improve air quality not being implemented. The council recognises that in general the options left are likely to be unpopular as there may be a cost implication or radical behavioural change required from the public.

7.9 Provide high quality public information and guidance on air quality (SO8)

The identification of potential problems and solutions relies on the provision of good quality, consistent and reliable information and advice. In order to reduce the possibility of unforeseen air quality impacts it is essential that a single point source of information is developed and made freely available.

The information should inform the public and assist developers in making sound choices in the selection of sites and allow them to address all air quality related issues at an early stage in the process.

If technical solutions are required, such as 'air quality impact assessments', additional traffic management measures, innovative design changes, financial contributions or other potential mitigating steps, they can be identified and discussed as early as possible in the process.

The information is likely to be generated in a variety of formats. It will include supplementary planning guidance, and the development of spatial information that can be used corporately to identify possible areas of concern.

7.10 Provide improved mapping layers and data via the corporate graphical information system (GIS) (SO9)

Information is not currently provided in this format and would need to be developed in a joint process involving the key stakeholders. Once developed, the information will be available via the website and mapping systems provided by Wiltshire Council.

Wiltshire Council is currently undertaking a project to centralise and standardise all of its available mapping information to improve accuracy and facilitate sharing of data.

7.11 Support planned economic growth, sustainable transport alternatives and reductions in climate change emissions (SO10)

The air quality strategy can be used to support well located, planned and implemented development as in many cases the air quality impacts can be eliminated or at least mitigated by careful design, location and traffic management.

By working collaboratively across the council it can also encourage sustainable transport solutions to congestion and support the overall reduction of climate change emissions by improving traffic related pollution.

8 Conclusions

8.1 The way ahead

The development of the Air Quality Strategy signifies the recognition that improving air quality is the responsibility of a wide range of stakeholders and professions. Actions need to be coordinated and prioritised to achieve improvements which are effective.

The areas of poor air quality in Wiltshire are all traffic related and it is recognised that tackling these areas is neither easy nor simple. It is only by working collaboratively and with local communities that progress can be made.

The current economic climate also has a significant impact on the resources which may be available to tackle poor air quality.

Although future improvements in local air quality are predicted as a result of technological advances and improved fuels, there is currently some doubt as to when or whether these improvements will occur. There is still a need to reduce the increasing reliance on private motor vehicle use and to provide access to improved public transport or other sustainable means of travel.

8.2 Action plan

A strategic action plan has been developed to identify a way forward on this difficult area. The plan identifies links between existing strategies and suggests a series of time related actions that should be taken to advance work in this area. The action plan is shown in figure 14 below.

Figure 16 Strategic Action Plan

No.	Action	Departments required to take forward action	Linked Strategies	Shared strategic objectives	Air Quality Strategic Objective	Timescale
1	Set up links with other LAs within the South West	<ul style="list-style-type: none"> • Public Protection Services 	<ul style="list-style-type: none"> • Wiltshire Air Quality Strategy 		SO5 SO6	Currently underway
2	Investigate introduction of Eco Stars scheme for commercial freight vehicles	<ul style="list-style-type: none"> • Highways • Climate Change • Public Protection Services 	<ul style="list-style-type: none"> • LTP3 Freight Strategy • LTP3 Public transport Strategy • LTP3 • Air Quality Action Plan • Energy Change & Opportunity Strategy 	Efficient freight movements Increased usage of low emission vehicles Reduce level of air pollutants and climate change emissions	SO1 SO2 SO4 SO10	End 2012
3	Develop and introduce Supplementary Planning Document and Developer Toolkits	<ul style="list-style-type: none"> • Public Protection Services • Spatial Planning • Development Control: Planning 	<ul style="list-style-type: none"> • Air Quality Action Plan • Draft National Planning Policy Framework • Wiltshire Core Strategy 	Support planned growth in Wiltshire Reduce impact on quality of life and built and natural environment	SO1 SO4 SO5 SO10	Informal guidance March 2012 Aim to adopt as formal SPD by end 2012

No.	Action	Departments required to take forward action	Linked Strategies	Shared strategic Aims	Air quality Strategic Objective	Timescale
4	Develop an air quality policy for inclusion in the Wiltshire Core Strategy	<ul style="list-style-type: none"> • Public Protection Services • Spatial Planning 	<ul style="list-style-type: none"> • Air Quality Action Plan • Wiltshire Core Strategy 	Reduce impact on quality of life and built and natural environment	SO5 SO7	End 2012
5	Work with relevant authorities and communities to develop and deliver agreed Air Quality Action Plans	<ul style="list-style-type: none"> • Public Transport • Highways • Public Protection Services • Spatial planning • Highways Agency 	<ul style="list-style-type: none"> • LTP3 • Air Quality Action Plan • Wiltshire Local Plan • Infrastructure Delivery Plan 	Efficient freight movements Sustainable transport alternatives	SO1 SO4 SO5	Ongoing
6	Prioritisation of existing and new air quality sites	<ul style="list-style-type: none"> • Public Protection Services 	<ul style="list-style-type: none"> • Air Quality Action Plan • Wiltshire Core Strategy • Minerals & Waste Core Strategy 		SO2 SO3	Mid 2012
7	Improve information on the website – possible formation of independent website page	<ul style="list-style-type: none"> • Public Protection Services 	<ul style="list-style-type: none"> • Air Quality Action Plan • Wiltshire Council Business Plan 		SO8 SO9	Mid 2012

No.	Action	Departments required to take forward action	Linked Strategies	Shared strategic Aims	Air quality Strategic Objective	Timescale
8	Investigate use of the Wiltshire Intelligence Network and South West Observatory websites for displaying AQ information	<ul style="list-style-type: none"> • Public Protection Services • Wiltshire PCT 	<ul style="list-style-type: none"> • Air Quality Action Plan • Wiltshire Council Business Plan 		SO8	Mid 2012
9	Produce summary reports on air quality to include in the Joint Strategic Assessment annually for Area Boards	<ul style="list-style-type: none"> • Public Protection Services 	<ul style="list-style-type: none"> • Wiltshire Air Quality Strategy 		SO7 SO8	March 2012
10	Produce a consolidated and updated Wiltshire Air Quality Action Plan	<ul style="list-style-type: none"> • Public Protection Services 	<ul style="list-style-type: none"> • Wiltshire Air Quality Strategy 	Reduce levels of air pollutants and climate change emissions	SO1 SO4 SO8	Mid 2012
11	Investigate the introduction of a Text Alert System warning of poor air quality to people with respiratory illness	<ul style="list-style-type: none"> • Wiltshire PCT • Public Protection Services 	<ul style="list-style-type: none"> • Wiltshire Air Quality Strategy • Health Strategies • Public Health White Paper 		SO8	Mid 2012

No.	Action	Departments required to take forward action	Linked Strategies	Shared strategic Aims	Air quality Strategic Objective	Timescale
12	Work with Spatial Planning and Development Services on locations of new residential accommodation for the elderly	<ul style="list-style-type: none"> • Wiltshire PCT • Public Protection Services • Development Control: Planning 	<ul style="list-style-type: none"> • Wiltshire Core Strategy 	Reduce levels of air pollutants and climate change emissions	SO5	Mid 2012
13	Investigate the feasibility of innovative solutions for school travel plans focusing on AMQA areas first	<ul style="list-style-type: none"> • Public Transport • Highways • Education 	<ul style="list-style-type: none"> • LTP3 Public transport Strategy 	Reduce travel by private car Develop school transport plans Sustainable transport alternatives	SO1 SO4 SO5 SO10	End 2013
14	Produce summary AQ documents for the public in plain English	<ul style="list-style-type: none"> • Public Protection Services 	<ul style="list-style-type: none"> • Wiltshire Air Quality Strategy • Wiltshire Business Plan • 		SO8	Mid 2012
15	Minimise traffic delays and disruption where they cause air quality exceedances in AQMAs	<ul style="list-style-type: none"> • Highways 	<ul style="list-style-type: none"> • LTP3 Network Management Plan 	Reduce levels of air pollutants and climate change emissions	SO1	As AQAP timescales

No.	Action	Departments required to take forward action	Linked Strategies	Shared strategic Aims	Air quality Strategic Objective	Timescale
16	Manage identified freight issues through appropriate interventions and improve the enforcement of weight and other restrictions through initiatives such as Lorry Watch.	<ul style="list-style-type: none"> • Highways 	<ul style="list-style-type: none"> • LTP3 		SO1 SO4 SO5	End 2013
17	Consider the development and adoption of a low emission strategy	<ul style="list-style-type: none"> • Spatial Planning • Development Control: Planning • ECO team • Public Protection Services 	<ul style="list-style-type: none"> • Wiltshire Core Strategy • Wiltshire Air Quality Strategy 		SO1 SO4 SO5 SO10	End 2013

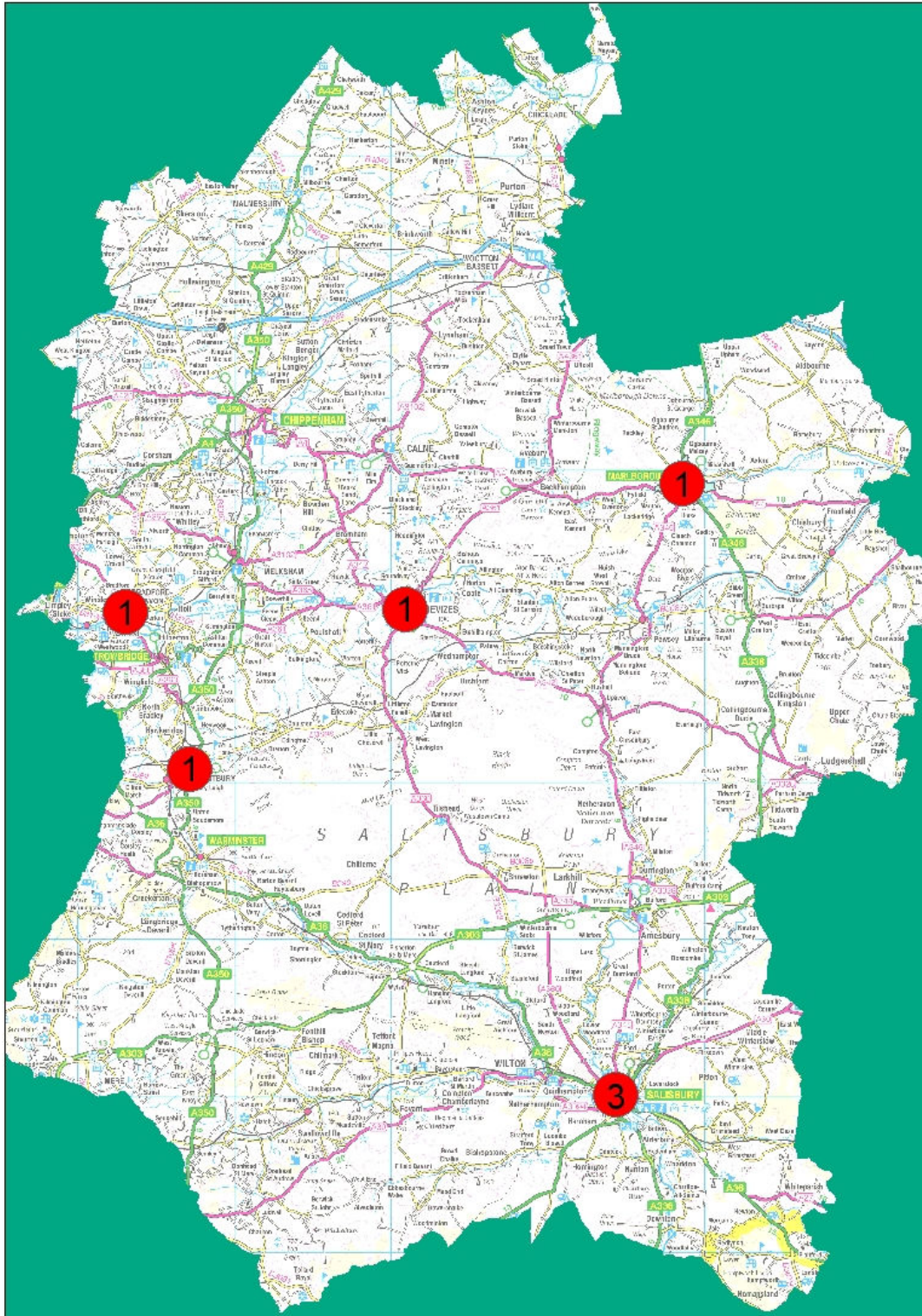
Appendices

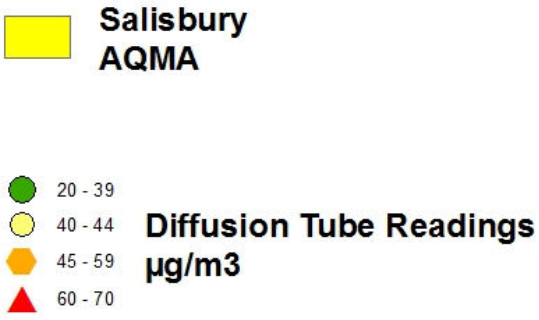
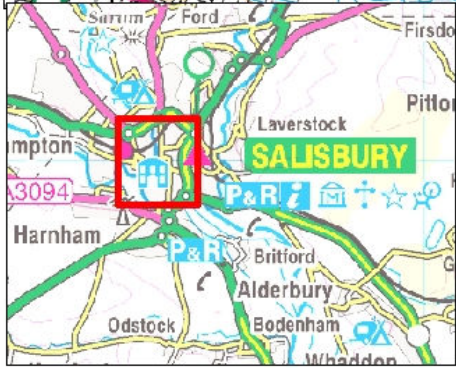
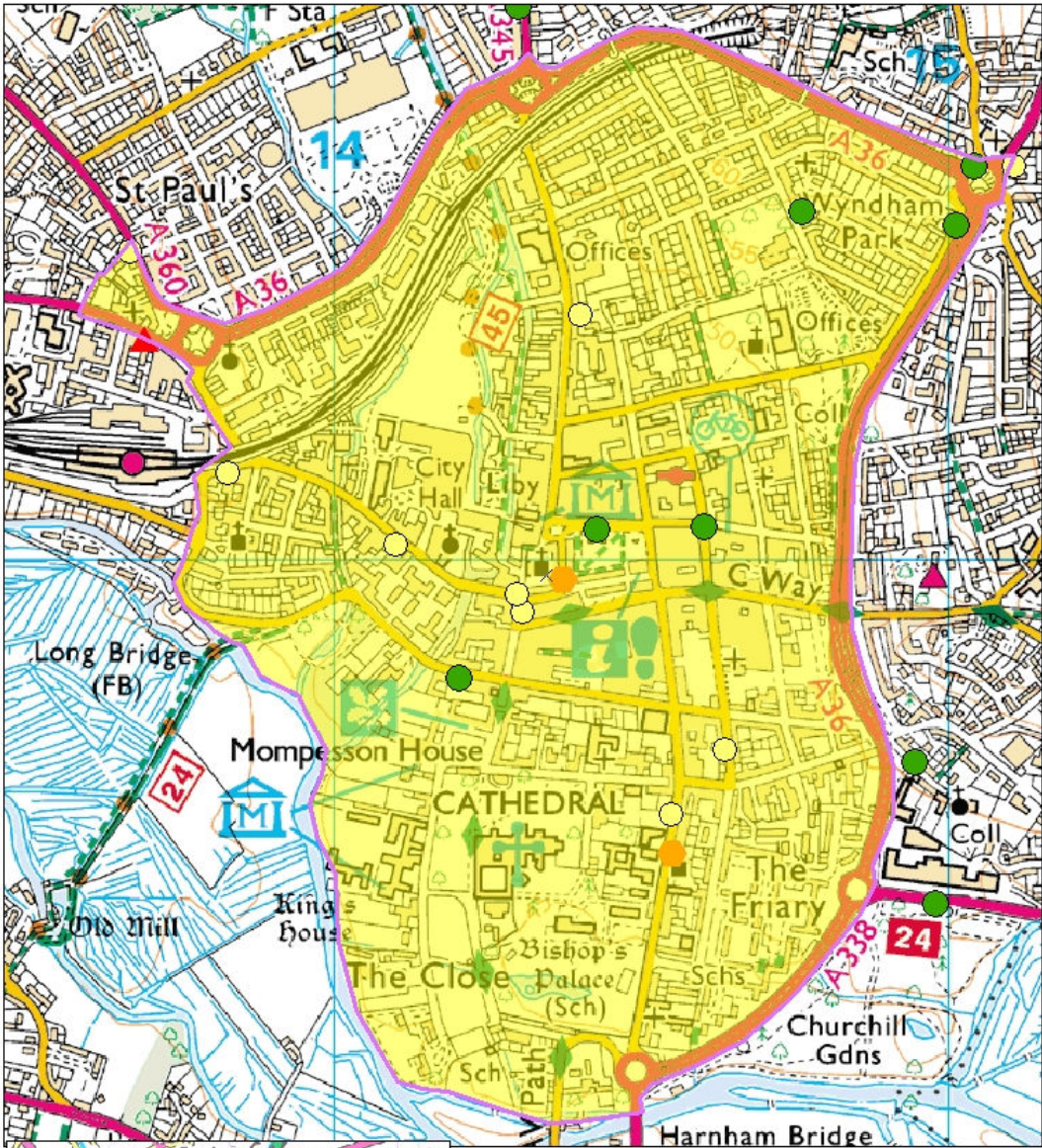
Appendix 1 Table of UK Air Pollution Objectives and Health Effects

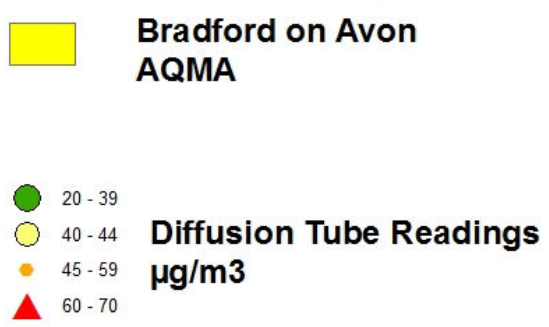
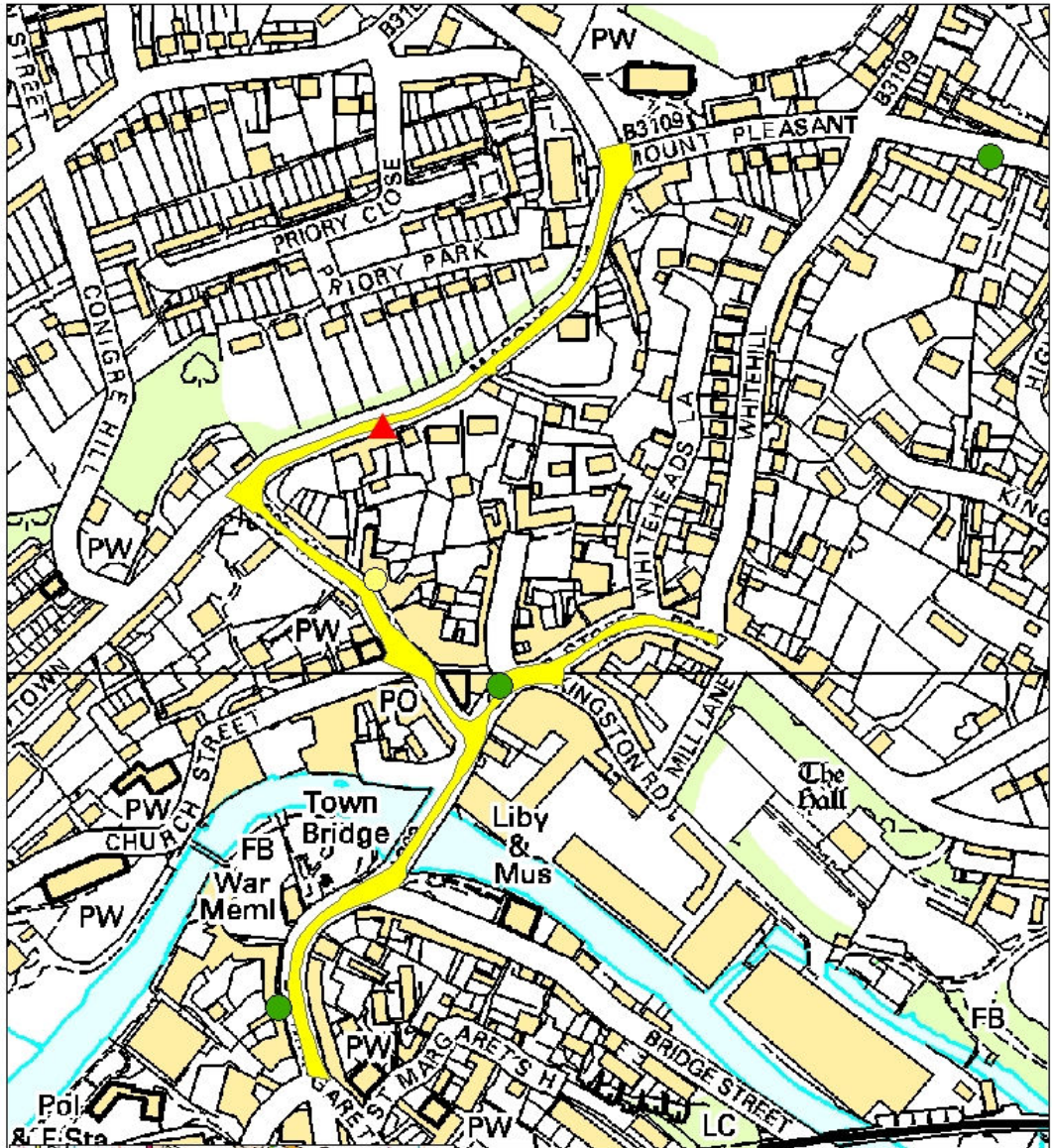
Pollutant	Source of Pollution	Health effect	Objective	Measured as
Benzene	Un burnt fuel in petrol vehicle exhaust and fuel evaporation during refuelling and industrial solvent use.	Human carcinogen, possible link to leukaemia in significant concentrations and long term exposure	5 µg/m ³	Running annual mean
1,3-Butadiene	Formed during the combustion of petrol and diesel. Industrial chemical plant and the manufacture of synthetic rubber tyres	Human carcinogen if prolonged exposure to high concentration.	2.25 µg/m ³	Running annual mean
Carbon Monoxide	Incomplete combustion of fuel	Prevents normal transport of oxygen by the blood. Can result in confusion, reduced coordination, reduced mental performance and death in high concentration. No permanent damage at low exposure concentrations	10 µg/m ³	Running 8 Hour mean
Lead	Industry	Impaired mental function and neurological damage in children	0.25 µg/m ³	Annual mean

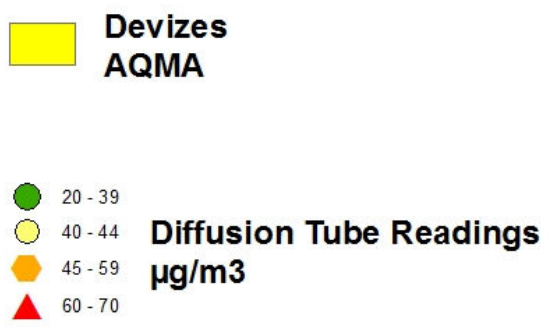
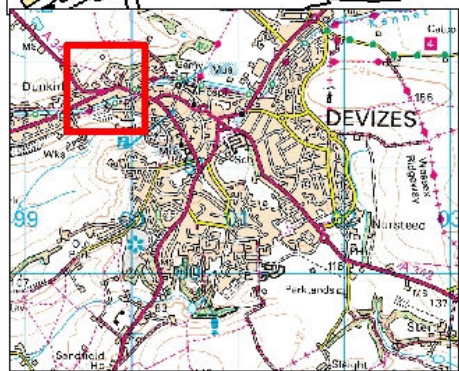
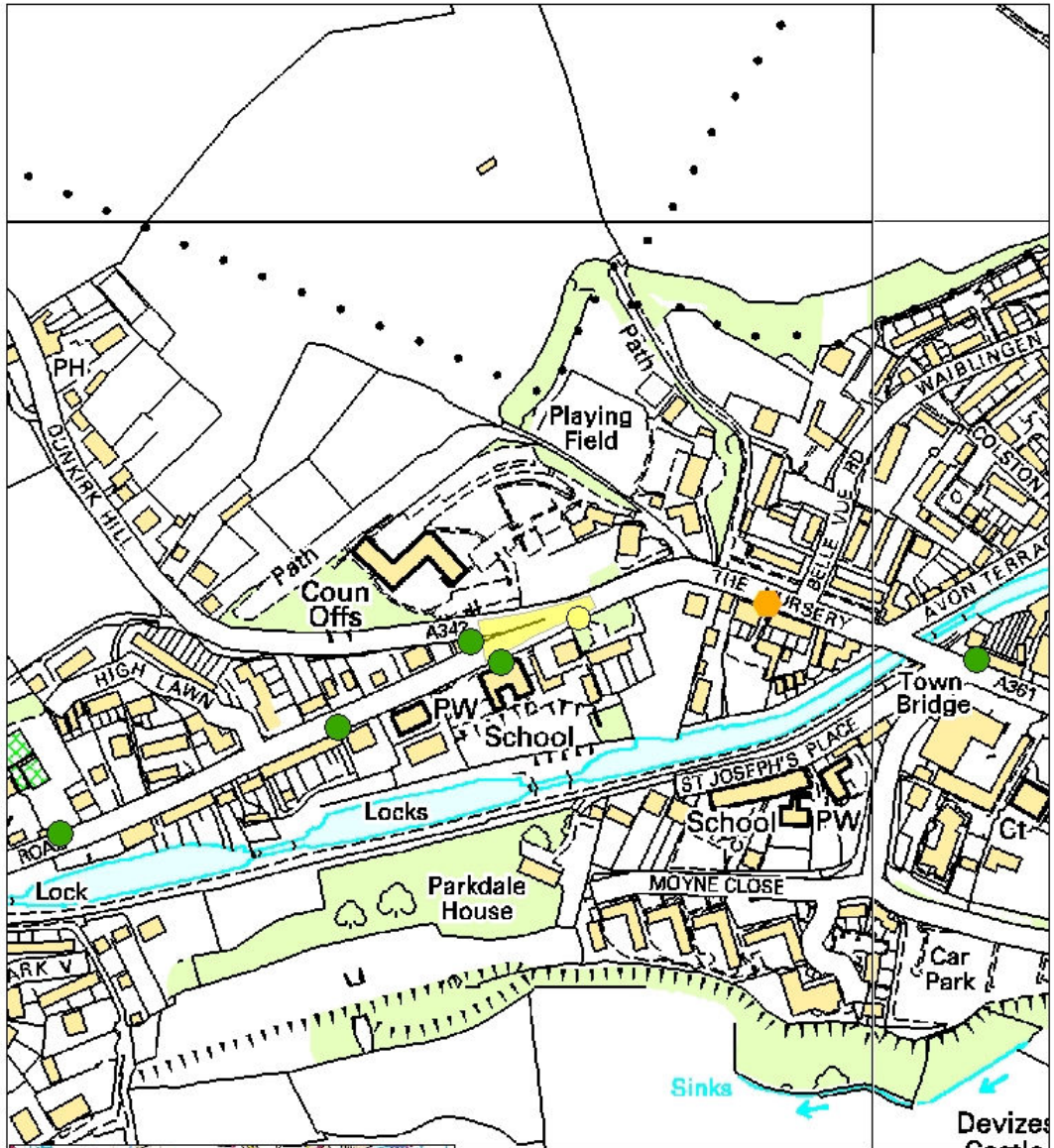
Pollutant	Source of Pollution	Health effect	Objective	Measured as
Nitrogen Dioxide	Nitric oxides derived from motor vehicles and other combustion processes	Irritates lungs, lower resistance to respiratory infections	40 $\mu\text{g}/\text{m}^3$ 200 $\mu\text{g}/\text{m}^3$ not to be exceeded more than 18 times a year	Annual mean 1 hour mean
Particles (PM ₁₀) (gravimetric)	Wide range of natural and manmade sources major local sources include Road traffic - combustion, brakes and tyres. Erosion of soils, quarrying, agriculture etc.	Particles enter lungs can cause inflammation and a worsening of heart and lung conditions	40 $\mu\text{g}/\text{m}^3$ 50 $\mu\text{g}/\text{m}^3$ not to be exceeded more than 35 times a year	Annual mean 24 hour mean
Sulphur Dioxide	Produced when sulphur containing fuel burned. Major source in UK is power stations	Reduced lung function in asthmatics. Respiratory impact	125 $\mu\text{g}/\text{m}^3$ not to be exceeded more than 3 times a year 266 $\mu\text{g}/\text{m}^3$ not to be exceeded more than 35 times a year 350 $\mu\text{g}/\text{m}^3$ not to be exceeded more than 24 times a year	24 hour mean 15 minute mean 1 hour mean

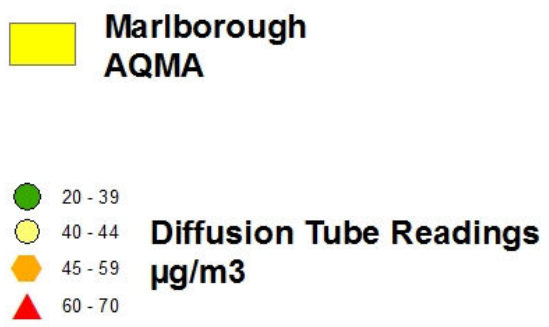
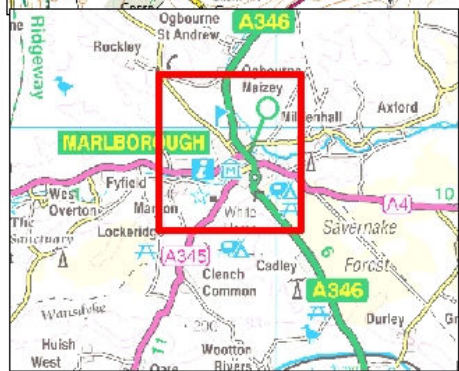
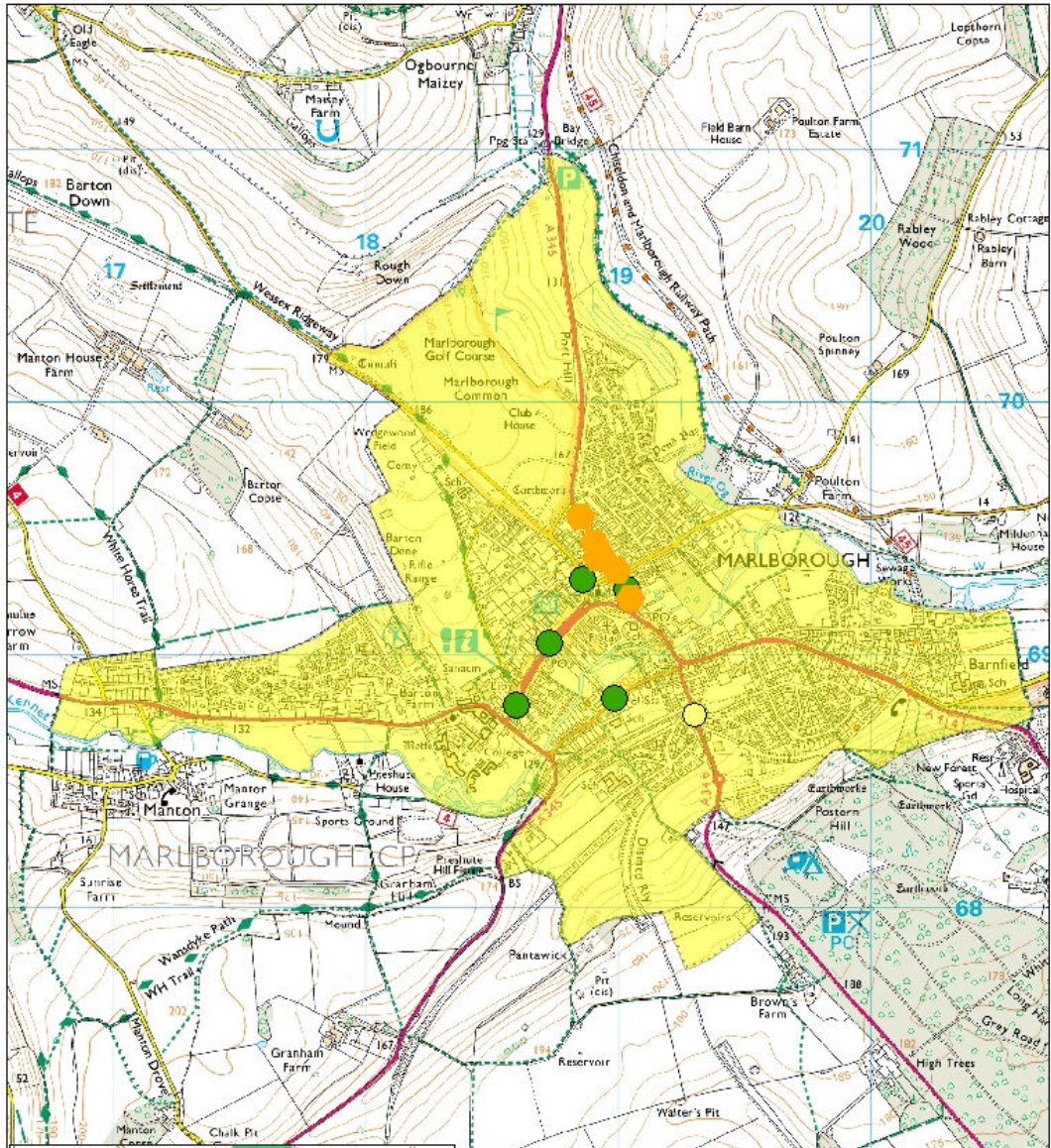
Appendix 2 Air Quality Management Areas in Wiltshire

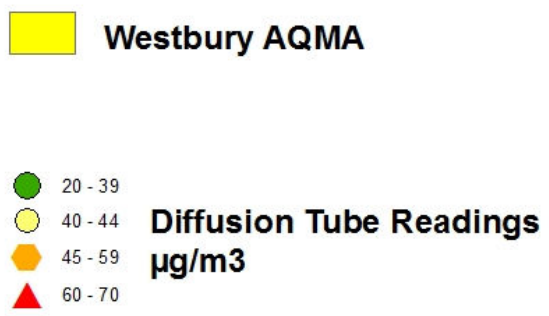
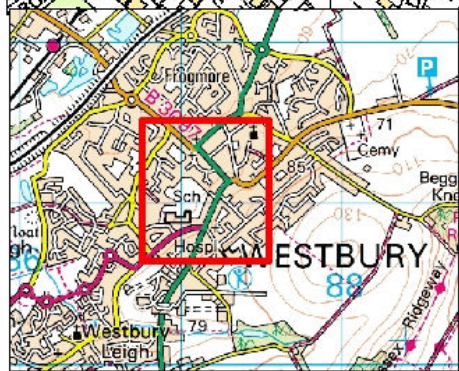
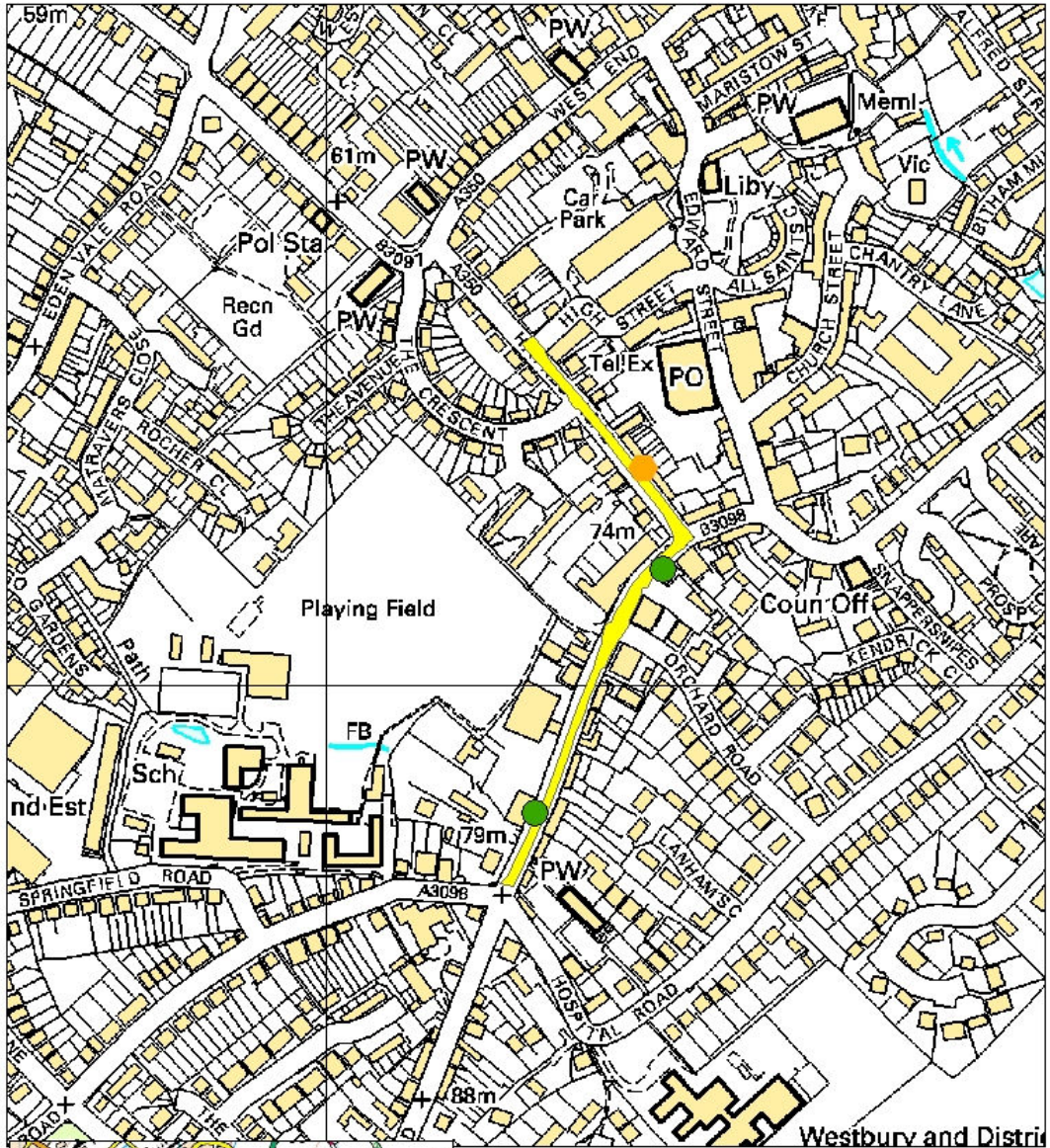












Appendix 3 Monitoring techniques, methodologies and data processing

The monitoring techniques Wiltshire Council employs to monitor nitrogen dioxide and small particulates are in accordance with statutory guidance produced by DEFRA: [Local Air Quality Management Technical Guidance LAQM.TG\(09\)](#)

The guidance details the monitoring techniques that should be employed, where to site monitoring, the duration and quality assurance and quality control.

Monitoring for Nitrogen Dioxide (NO₂)

Diffusion Tubes

The measurement of nitrogen dioxide is initially undertaken using a diffusion tube. These are simple acrylic tubes, closed at one end that contains a chemical that can absorb nitrogen dioxide from the atmosphere.

They are widely used for indicative monitoring and are particularly useful for longer term monitoring usually for a minimum period of a year. The tubes are relatively cheap and for this reason can be used at a large number of locations for a period of many years if necessary. The tubes are used to give an indication of the levels of nitrogen dioxide and to help determine if other more accurate forms of measurement are required.



Tubes are generally mounted on lampposts or downpipes on buildings at a height of around three metres, and exposed to the air for a period of one month before being swapped with a replacement tube.

The tubes are then analysed at an accredited laboratory and the amount of nitrogen dioxide they have been exposed to over the month is measured. The results of the analysis are then provided on a monthly basis. At the end of the year the twelve monthly averages are added together and divided by twelve to produce a mean annual average.

Co-location studies and adjustments to diffusion tubes

Diffusion tubes have an overall uncertainty of about +/- 20% so an appropriate 'bias adjustment' factor is applied to the annual mean. Bias represents the overall tendency of the diffusion tubes to depart from the true value, i.e. to over read relative to the automatic analyser results. The bias adjustment factor may be determined from a local study that

has co-located diffusion tubes with an automatic analyser, or from the national database of co-location studies.

When an automatic monitoring station is sited, three diffusion tubes are also placed in the immediate vicinity. This is known as a co-location study and allows the readings from the diffusion tubes to be compared with the more accurate automatic monitoring results. This in turn allows an adjustment factor to be calculated to standardise the tube results at the end of the year.

These bias adjustments are calculated using the combined information from a range of monitoring sites across the country in accordance with the guidance issued by Defra. The adjustment factor is calculated once a year and issued to local authorities to allow them to adjust all tube results for the previous year.

Automatic Monitoring Stations (nitrogen dioxide and small particulates)

Nitrogen dioxide

If the second stage assessment and use of diffusion tubes has indicated that further monitoring is necessary an automatic monitoring station is usually located at or as near as possible to the area of concern.

These automatic monitoring stations (AMS) are much more accurate than the diffusion tubes and measure the nitrogen dioxide levels on an hourly average basis. This monitoring continues over one or more years and allows the 200 $\mu\text{g}/\text{m}^3$ hourly target to be assessed as well as the annual mean average to be accurately measured.

The monitoring stations require regular site visits to carry out equipment checks, manual calibrations and routine maintenance such as changing filters. These checks are all part of the quality assurance and control programme to ensure data is accurate and valid.



Only if acceptable data quality and high capture rates are achieved can the performance of the analyser be regarded as fully satisfactory. (A data capture of 90% for ratified (i.e. usable) data is recommended as a target for automatic monitoring)

The hourly data is downloaded from the machine onto a computer so that it can be converted from raw values to more useful pollutant concentrations. Once a calibration factor has been applied, the data is screened by visual examination for any unusual measurements (possibly due to equipment failure, power failures, human error). The data is then ratified to ensure the data has been scaled correctly amongst other factors.

Once the data has been through this process the hourly readings are added up over a month period then divided by the number of hours in that month to provide a monthly average. At the end of twelve months the twelve monthly averages are used to calculate the mean annual average.

Particulates (PM₁₀)

Wiltshire currently measures particulates in three locations using fixed monitoring locations similar to the AMS above. The particulate monitors have to be located adjacent to the location being assessed and produce data which is downloaded and used to calculate the annual and 24 hour means listed in the air quality standards.

Wiltshire data

Background monitoring was undertaken for a number of years across Wiltshire but it was found that in practice many of our normal monitoring locations had a number of diffusion tube results that were significantly below the threshold of 40 µg/m³ and not noticeably different to the background results. For that reason specific background monitoring is now rarely carried out.

Tube locations are now in areas where it is suspected that air quality standards may not be met.

The data is corrected annually and the results compared to the air quality standards.

In practice the monitoring results demonstrate that air quality in Wiltshire is very good. Even in areas with property close to the highway where significant traffic flows or congestion have been identified the air quality is still of the required standard in the majority of cases.

There are however a small number of locations where air quality is of concern and an even smaller number where the health impacts require additional assessment. Currently only 3 locations are returning levels of $60 \mu\text{g}/\text{m}^3$ out of the 95 being assessed. Even within an established air quality management area only a very small number of properties are exposed to the higher level of nitrogen dioxide.