



Review of Effectiveness of Local Authority Action Plans and Future Policy Options for LAQM

June 2013



Experts in air quality
management & assessment

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Contents

1	Introduction	2
2	Work Package 1.....	4
3	Work Package 2.....	17
4	Work Package 3.....	30
5	Conclusions and Recommendations	38
6	Appendices	42
A1	Local Authorities Selected for Case Study Review	43
A2	On-line Survey Responses	45
A3	Assessment of USA and Progress Reports.....	58

1 Introduction

- 1.1 Air Quality Consultants Ltd (AQC), in association with Aether Ltd., has been commissioned by Defra to undertake a review of the effectiveness of local authority Air Quality Action Plans and future policy options for Local Air Quality Management (LAQM).
- 1.2 The process of Local Air Quality Management (LAQM) requires local authorities to conduct periodic reviews and assessments of air quality in their areas. Where it is identified that the air quality objectives will not be met, the authority is required to declare an Air Quality Management Area (AQMA), and to then prepare an Air Quality Action Plan containing a package of local measures to improve air quality in pursuit of the objectives. To date, some 250 local authorities across the UK have declared AQMAs.
- 1.3 A review of the LAQM process was carried out in 2009/2010¹. This concluded that the review and assessment part of the LAQM regime was working very well, albeit the process is prescriptive and process-heavy, with an obligation to produce reports on an annual basis. This obligation falls on all local authorities, regardless of whether compliance with the air quality objectives is likely to be an issue. In contrast to the review and assessment part of the LAQM regime, the action planning components of LAQM were found to be not working well. Whilst many local authorities expend considerable effort in drawing up their action plans, the measures that they propose are often not quantified or effectively implemented, and even where they are, the air quality improvements they have delivered fall considerably short of what is required to attain the objectives. There are a number of factors that contribute to this problem.
- 1.4 The aims of this research project are to assist Defra in the development of future policy for Local Air Quality Management, with the focus on maximising the benefit from local action plan measures to assist with achievement of the objectives/limit values, and to reduce the burden on local authorities where appropriate. The project has been undertaken within a number of discrete, but interconnected, Work Packages.
- 1.5 **Work Package 1:** This has focused on a review of the outcomes of the action planning process to date, in order to provide an evidence base for the following questions:
- To what extent have the proposed measures in the action plan been implemented, and what have been the principal barriers/drivers to implementation;
 - To what extent have individual measures, or packages of measures, been quantified (as either emissions or concentration reductions), and has the approach taken been robust;

¹ Review of Local Air Quality Management: A report to Defra and the Devolved Administrations. (IHPC, January 2010)

- To what extent have the implemented measures have been successful in reducing emissions/concentrations, and/or in revoking AQMAs, and what would have been the likely implications to ambient air quality and national emissions had local authority action planning not been implemented; and
- To what extent has the success of the implemented measures been hampered by issues beyond the authorities' control e.g. the on-road performance of vehicles as compared to the emissions forecasts, increases in traffic flows etc.

1.6 **Work Package 2:** This has focussed on alternative approaches that could be considered to improve the effectiveness of action plans, and the corresponding risks, benefits and opportunities afforded by each, in order to answer the following questions:

- What alternative management approaches could be used for the development of action plans;
- What would be the implications for the review and assessment approach of introducing an “emissions driven” approach for action planning;
- What additional training and skills would be required to implement the changes, and what implications could this have on successful delivery; and
- Could the action planning process be modified to deliver improvements to critical pollutant concentrations which are below the objectives/limit values.

1.7 **Work Package 3:** This has focussed on the review and assessment reporting cycle, and associated burden on local authorities, in order to answer the following questions:

- Could certain elements of the reporting burden be eased for all local authorities;
- Could certain elements of the reporting burden be eased for those local authorities where pollutant concentrations are well below the air quality objectives/limit values; and
- What risks and benefits might be associated with a reduced reporting burden?

Acknowledgements

1.8 The Project Team are extremely grateful to the many local authority officers who participated in this project, providing valuable insight into working practices to date, and their visions and concepts for the future.

2 Work Package 1

2.1 This element of the study was completed within three main task areas:

- Review of Action Plans to identify those suitable for further investigation;
- Detailed case studies of selected action plans
- Evaluation of the benefits of the current system

Review of Action Plans

2.2 The first stage of the study involved the review of 49 action plans. The intent of this exercise was to identify 20 action plans suitable for a more detailed case study review. Only those authorities that had adopted an action plan prior to January 2010 were considered; this was to allow adequate time for implementation of the measures to have taken place.

2.3 The focus was intentionally towards those local authorities where it was believed that action plan implementation had been successful, and as such, the shortlist was based on prior knowledge, largely through the helpdesk/appraisal of action plans, appraisal of grant applications and general knowledge of the Project Team. The list included a number of authorities with different types of AQMAs (i.e. whole borough, Highways Agency roads, large urban areas, market towns, street canyons, slightly more rural areas), giving a broad geographic spread. In all cases, the focus was upon traffic-related AQMAs where there are exceedences of the annual mean NO₂ objective, as this is the principal issue of concern.

2.4 The local authority action plans that were selected for this initial review are shown in Table 1 below.

2.5 The review considered the original Air Quality Action Plan and the most recent Progress Report, with regard to the following questions:

- Had a source-apportionment study been carried out to inform the AQAP?
- What were the principal measures included in the AQAP?
- Had any quantification (in terms of emissions or concentrations reduction) been provided in the AQAP?
- Had any quantification (in terms of emissions or concentrations reduction) been provided in the Progress Report?
- Could any quantification assigned be used to estimate the benefits of the measures?
- To what extent had the AQAP measures been implemented?
- What had been the principal drivers/barriers for implementation?

- Which measures had been particularly effective, and what were the critical success factors?
- To what extent had the implemented measures been successful in reducing emissions/concentrations?
- Had LDF policies been established to drive down transport emissions via planning?
- Did the authority have Supplementary Planning Guidance on air quality?
- Did the authority seek s106 agreements related to AQ or Low Emissions Strategies, and seek developer contributions through s106 agreements or the CIL?

Table 1: Local authorities selected for initial review¹

Birmingham City Council	Reading Borough Council
Bradford City Council	Reigate and Banstead Borough Council
Bristol City Council	Sevenoaks District Council
London Borough of Camden	South Lakeland District Council
Cardiff City Council	Sheffield City Council
Chichester District Council	Slough Borough Council
Chiltern District Council	South Cambridgeshire District Council
Corporation of London	Southampton City Council
London Borough of Croydon	Stockport Council
Edinburgh City Council	Suffolk Coastal District Council
Glasgow City Council	Tonbridge and Malling District Council
Gravesham Borough Council	Tunbridge Wells Borough Council
London Borough of Greenwich	West Oxfordshire District Council
London Borough of Hillingdon	London Borough of Waltham Forest
Kingston upon Hull City Council	Warwick District Council
Lancaster City Council	Vale of White Horse District Council
Lewes District Council	Winchester City Council
Maidstone Borough Council	York City Council
Monmouthshire County Council	Exeter City Council
Newcastle City Council	NW Leicestershire District Council
Newport Council	Bromsgrove District Council
Norwich City Council	Perth and Kinross Council
Nottingham City Council	Rushcliffe Borough Council
Oxford City Council	Royal Borough of Windsor and Maidenhead
Plymouth City Council	

¹ In total, 67 local authorities were considered for the assessment, but 18 of these were rejected without a full review as no recent Action Plan Progress Reports were available.

2.6 From the review of these 49 local authorities, 20 authorities were selected for a more detailed Case Study, and are shown in Table 2. The justification for this selection, and the evidence base for the conclusions below, is summarised in Appendix 1.

Table 2: Local authorities selected for Case Studies

Bristol City Council	Newport Council
London Borough of Camden	Norwich City Council
Cardiff City Council	Nottingham City Council
Corporation of London	Oxford City Council
London Borough of Croydon	Perth and Kinross Council
Exeter City Council	Rushcliffe Borough Council
Gravesham Borough Council	Royal Borough of Windsor and Maidenhead
London Borough of Hillingdon	Sheffield City Council
Lewes District Council	Stockport Council
Newcastle City Council	York City Council

2.7 Some broad conclusions that can be drawn from the evaluation of the Action Plans implemented by these 20 authorities are summarised below.

- Little or no quantification of the measures (in terms of reductions in emissions or concentrations) has been carried out in any precise manner. Where quantification has been included, it has been based on broad categories (e.g. “high”, “medium” and “low”). In some cases, an estimate of the impact of the measures is expressed in terms of reductions in traffic volumes, or expected reductions in NO_x emissions, but as the geographic scale over which the measure(s) was implemented is not stated, it is difficult to estimate in any precise manner what the overall benefits have been.
- Authorities have been successful in implementing a wide range of measures, particularly within those areas for which the authority has direct control. There is, however, some evidence that some major schemes have been withdrawn due to funding cuts or delays in Major Scheme Bids.
- There are a number of examples where the integration of the AQAP into the LTP process has proved very successful.
- Although there has been wide-scale implementation of a range of measures, there has been little evidence of nitrogen dioxide concentrations declining. Exceptions to this are associated with a pedestriansied street in central Oxford, road layout changes to Grapes Hill in Norwich, the closure to traffic of St Mary Street in Cardiff and the realignment of the A2 trunk road in Gravesham. These are discussed in further detail below.

Case Study Reviews

2.8 The Case Study Reviews involved two elements of work;

- Completion of an on-line survey by the local authorities; and
- Follow-up telephone discussions (Sounding Board) to clarify and expand upon important issues.

On-line Survey

- 2.9 A survey for on-line completion by the Case Study authorities was prepared. The questions asked within this survey, and a summary of the responses received, are provided in Appendix 2. Some of the key issues arising from the survey are provided below.
- 2.10 **What is the purpose of the LAQM regime?** Respondents to the Survey indicated a need to review the purpose of LAQM, and the roles of central and local governments. For example, should local authority action planning be focused on achieving the objectives/limit values, or should it take a more holistic approach in driving down emissions?
- 2.11 **Improvements to guidance on the selection of action plan measures.** Respondents to the Survey indicated a need to improve the case studies, to provide guidance that is current, focused on demonstrated successes specifically with regard to reducing NOx emissions from road transport.
- 2.12 **Improved guidance on quantifying costs and benefits, and how to track real improvements.** Possible solutions that were suggested to improve guidance include:
- Tools to support quantitative assessment of costs/benefits (perhaps provided on-line).
 - Clear and ready provision of key datasets is important, for example, information relating to road transport from DfT – current fleet mix profiles, emission factors for different Euro standards etc.
 - More "rules of thumb" in the guidance i.e. assumptions that should be used if the information is not readily available to the LA.
- 2.13 **Challenges associated with the local authority control of important emission sources.** Possible solutions that were suggested include:
- Introducing a legal framework that requires partners to be responsible for helping to draw up the plans and to implement measures (not just by naming them in an action plans).
 - Providing guidance on the role of regional co-ordination (or even requiring this as part of the AQAP process) would help to address issues relating to economic displacement.
- 2.14 **National Level Co-ordination.** Respondents to the Survey suggested that consideration should be given to national level schemes for specific measures e.g. a national framework of LEZ's with fixed implementation standards/details.
- 2.15 **Streamlining of reporting.** A number of respondents to the Survey suggested a review of the reporting requirements for both Review and Assessment and action planning.

2.16 **Lack of important “profile” for AQ issues, with no sense of urgency.** There are a number of steps that could be taken at the national level to raise awareness – advertising campaigns etc. There are examples of successes from the climate change community.

- It was suggested that Defra should be more active in assessing the work being done by authorities, with consideration being given to the use of penalties to address work that is of poor quality.
- It was suggested that funding routes, other than the grant scheme, need to be made available. This is particularly to help with major infrastructure projects – which appear to be the only measures delivering substantial impacts.

Sounding Board

2.17 Following the on-line survey, seven local authorities were directly interviewed on a number of questions, principally pertaining to the key issues highlighted above. The questions, and a summary of the responses, are provided below.

2.18 **What would be the advantages and disadvantages of using an emissions-driven approach (as opposed to an approach targeted on achieving the air quality objectives) for LAQM, and would this have changed the action planning measures implemented to date, or the outcome of those measures?** There was a unanimous response that it is easier to sell the benefits in terms of “emissions reduction” to transport and development control planners, and to local politicians; where nitrogen dioxide concentrations are not declining, it is difficult to sell the benefits to non-specialist audiences. To a large extent though, the focus has generally been on driving down emissions (rather than an explicit focus on concentrations), and in many cases the measures that have been implemented to date, and the outcomes achieved, would not have changed had a different approach been in place. However, such an emissions-driven approach has, in some cases, focused attention on the other environmental benefits of action plan measures (e.g. related to CO₂ reduction), and has driven forwards additional measures (e.g. use of alternative fuels). It was generally accepted that consideration needs to be given to hotspots (as well as to the wider scale) although this is dependent upon the nature of the exceedences (i.e. whether they are confined to small hotspot areas, or cover much wider areas). There was unanimous agreement that targets related to concentrations should remain in place (as opposed to targets for emissions reduction) as this is the principal indicator for public health.

2.19 **What types of tools or guidance could be provided to assist with the quantification of costs and benefits?** There was a general consensus that the provision of simple tools (e.g. in spreadsheet format) would be valuable in assisting local authorities to estimate the costs and benefits of action plan measures. The principal reason that quantification has not been carried out to date, is cited as cost, as it would normally necessitate the use of consultants. There was a mixed response regarding the availability of key data input assumptions such as traffic data, and

advice on scenario testing and source apportionment; London authorities have access to the LAEI, and where the AQAP is integrated into the LTP, the traffic data are available. A number of local authorities have (or have just received Defra grant funding to support) established sophisticated local emissions and scenario testing models. Better quantification of fleet mix and age profiles would allow more accurate assessments and scenario testing to be carried out. Guidance on the quantification of the impact of idling vehicles was also mentioned. Strong support for the provision of better case studies or support information on action plan measures that are proven to reduce emissions.

- 2.20 ***What would be the advantages and disadvantages of formally assigning responsibilities for implementing air quality improvement measures to other tiers of local government or other government agencies?*** Generally good interaction with those responsible for transport planning was cited, but this is often dependent upon the individuals involved. It was suggested that it could assist implementation if a statutory responsibility were placed on those bodies with the principal control of the emissions sources (e.g. road traffic), but care would need to be taken as to how such shared responsibilities could work in practice. Care would also need to be taken to ensure that action plan measures under such a system were designed so as not to improve air quality in one area (under the control of the transport authority) but worsen it in another (where the transport authority has no responsibility).
- 2.21 ***Would formalising a requirement for some level of regional coordination in air quality action planning be useful?*** Good relationships at the regional level were cited and many authorities work closely together within Steering Groups. However, it was suggested that a formal obligation on authorities at a regional level could be beneficial. Examples cited included developers weighing up one authority against another, and potential reluctance by an authority to include more stringent air quality mitigation in the current economic climate; reluctance to adopt regional agreement on some issues due to local pressures for economic development and growth. Within London, there is the potential to require adoption of a minimum package of standard measures (enforced by GLA) with regard to issues such as NO_x emissions from boilers, parking provisions etc.
- 2.22 ***Would national level coordination or frameworks be useful for certain types of measures?*** General support for the use of national frameworks was expressed. Several examples were cited of difficulties associated with trying to introduce freight operator recognition schemes for NO_x, which has resulted in protracted negotiations or refusal (as a CO₂-related scheme is already in place).
- 2.23 ***Is streamlining of LAQM reports required?*** Unanimous response that the production of annual reports is not over-burdensome, but that the format of the templates could be adjusted so that the reports are more suitable for direct communication to local politicians and members of the public. Strong support for annual reporting was voiced (although this was from local authorities that have air quality problems) – one of the benefits of the LAQM system is that it allows local authority

officers to have a clear knowledge of the air quality problems in their areas, and this needs to be kept up to date.

- 2.24 ***What national level initiatives could be implemented to raise the profile of air quality, and would this assist the implementation of action plans at a local level?*** Air quality is often seen as a low priority issue by local politicians, businesses and members of the public. Communication of these issues requires careful consideration with input from experts in the public health and public relations arenas. Central government needs to raise the profile of the links between air quality and public health in a clearly-understandable manner, and with the same effort that has been devoted to issues such as obesity and passive smoking. Action at a local level could be supported by a “media package” provided by Defra which could provide a framework for communicating the issues.

Evaluation of the Benefits of the Current System

- 2.25 Undertaking an evaluation of the benefits that the action planning process has delivered to date is not straightforward. As set out in the sections above, the Action Plans provide little or no quantification in terms of the expected emissions or concentration reductions, and where measures have been estimated or quantified in terms of other metrics (such as a reduction in the number of vehicle-kilometres etc.) the geographic extent of the expected change is not provided. A further confounding factor is that the implemented measures have undoubtedly been hampered by issues beyond the authorities’ control, and in particular the actual on-road performance of vehicles in comparison to the forecast reductions expected from the introduction of increasingly stringent Euro standards.
- 2.26 It was concluded that any attempt to quantify the benefits of local authority Action Plan measures, e.g. in terms of a reduction in UK vehicle-kilometres in areas above the objective/limit value, would be subject to considerable uncertainty. An evaluation of the benefits delivered to date has therefore been based on²:
- Reviewing the outcome of specific Action Plan measures identified from the Case Studies;
 - Evaluating the role of Action Plan measures in AQMA revocations; and
 - Reviewing the On-line survey and Sounding Board comments.

² An analysis of monitoring data was also carried out to compare trends in concentrations at locations where an AQAP had and had not been implemented, but the outcome was inconclusive and is not reported here.

Outcome of Case Study Reviews

- 2.27 As part of the Case Study reviews that were carried out, evidence of action plan measures that had brought about, or influenced reductions in nitrogen dioxide concentrations, were identified³. Additional information was then derived from follow-up telephone discussions.
- 2.28 **Cardiff City Council – St Mary’s Street AQMA:** The City Council declared the St Mary’s Street AQMA in September 2002, for exceedences of the annual mean objective for nitrogen dioxide. Both St Mary’s Street and the High Street are of strategic importance, providing support to the local economy as a primary shopping and leisure destination. The AQAP was developed over a number of years, with elements of the plan introduced incrementally. It was realised at an early stage that complete removal of traffic from St Mary’s Street/High Street was not feasible due to the severe adverse impact of retail premises, and plans were devised to develop a “pedestrian-friendly environment” where as many vehicles as possible would be removed. By early 2010, much of the traffic had been removed by the prevention of southbound movements and removal of all private vehicles, and the removal of northbound traffic by the creation of a “bus-box” network that allowed the rerouting of buses around the city centre. It is too early to confirm the outcome of these schemes, but measured nitrogen dioxide concentrations in 2010 were below the objective for the first time, declining from levels of between 50-70 µg/m³ in 2008-2009. The total estimated cost for the works was £13.8m.
- 2.29 It must be recognised that improvement of air quality was not the sole objective for the package of measures that were implemented, but it was recognised by local politicians to be an important factor, and the development of the AQAP played a key role in driving forwards the strategic objectives.
- 2.30 **Gravesham Borough Council – A2 Trunk Road AQMA:** The Borough Council declared the A2 Trunk Road AQMA in April 2001, for exceedences of the annual mean objective for nitrogen dioxide and the daily mean objective for PM₁₀. The AQMA boundary encompasses the entire length of the A2 Trunk Road through the Borough, including over 11 residential properties. The Stage 4 assessment that was carried out in 2002 identified that road traffic emissions from the A2 were the major contributor to nitrogen dioxide concentrations. Plans by the Highways Agency to widen the A2 had been in place for some time, but a number of options were under consideration, including simple widening (which would have moved the carriageway closer to the houses and exacerbated the air quality problem), widening without realignment of the kerb (which would have provide little air quality benefit) and realignment “off line” (the “red route” option). The AQAP was instrumental in providing the evidence base to the Secretary of State in favour of the red route

³ There are other examples where the AQAP process has successfully reduced pollutant concentrations from industrial operations. These have not been explicitly reported here, and the focus has been on exceedences of the annual mean objective/limit value for nitrogen dioxide.

option (which was the third most expensive option under consideration). As a result of the improvement works the carriageway of the A2 Trunk Road was moved up to 250 metres from the nearest residential dwellings, with the whole works completed at the end of 2008. The recent (June 2011) Further Assessment completed by the Council has confirmed that air quality within the residential areas to the north of the A2 Trunk Road has improved dramatically since the realignment; there are large areas of residential housing where annual mean nitrogen dioxide levels have fallen to below the objective, and there are no longer any exceedences of the PM₁₀ objective.

- 2.31 Improving air quality conditions was not the sole objective of the A2 Trunk Road widening (which would have occurred anyway) but the AQAP was instrumental in providing the evidence base for the more costly option that would provide the significant environmental benefits.
- 2.32 **Oxford City Council – Queen Street Pedestrianisation:** A city centre AQMA for exceedences of the annual mean nitrogen dioxide objective was declared by Oxford City Council in 2000. Since that time, there have been a number of iterations resulting in the declaration of a city-wide AQMA in 2010. The Oxford Transportation Strategy (OTS) identified the pedestrianisation of Queen Street as a priority for Oxford, but there were a number of schemes under debate. The development of AQAP informed this debate, providing the evidence base to the County, particularly for preparation of the 2006 LTP. The pedestrianisation scheme (£985,000) was given the go-ahead in 2009. There appear to have been substantial reductions in annual mean nitrogen dioxide concentrations within the pedestrianised area, from levels that were previously above 80 µg/m³ to levels of around 50 µg/m³.
- 2.33 **Norwich City Council – Grapes Hill Realignment:** The Grapes Hill AQMA was declared for exceedences of the annual mean nitrogen dioxide objective by Norwich City Council in 2003. The original Action Plan that was prepared was subsequently integrated into the LTP in 2005. One of the measures identified was to introduce improvements to the junction at the top of Grapes Hill; this involved a modification to the traffic light sequence to reduce congestion, and widening of the road by removal of a grass verge. Nitrogen dioxide concentrations have now remained below the objective for a number of years and there is intent to revoke the AQMA.
- 2.34 The improvements were implemented on the basis of improving air quality conditions and reducing traffic congestion, but the evidence base was provided via the Action Plan.

Revocation of AQMAs

- 2.35 One possible metric that could be used to evaluate the benefits of the current system is to identify the number of AQMAs that have been revoked. This is potentially an attractive option as it may be expected that, in most cases, the revocation will have been supported by robust monitoring data.

2.36 A total of 43 local authorities have revoked AQMAs since the LAQM system was introduced. Of these, 14 authorities revoked AQMAs as part of an amalgamation into a larger, single area, or as result of one of the pollutants (PM₁₀) recording levels below the objective (while the AQMA was retained for nitrogen dioxide). A further six revocations were related to exceedences of the sulphur dioxide objective (as a result of an industrial premises closing down, or as a result of a more detailed assessment), two with regard to PM₁₀ (Kings Lynn & West Norfolk BC and South Lakeland DC,) and one with regard to benzene concentrations at a petrol station. As the focus of this study is on nitrogen dioxide, these other AQMAs have not been considered further. Of the remaining authorities, five had prepared Action Plans; in the case of the other authorities the requirement for an AQMA was removed after more detailed information (traffic data, monitoring etc.) became available, or in one case where a new bypass directed traffic away from the village.

2.37 The Action Plans and Review and Assessment reports for these five authorities have been evaluated to identify what role the AQAP measures may have had in the revocation of the AQMA.

- **Oadby & Wigston DC:** At the conclusion of the first round of Review and Assessment, four AQMAs were declared with regard to exceedences of the annual mean objective for nitrogen dioxide. These exceedences were based on modelled values, with insufficient monitoring to support the conclusions. The 2006 USA was based on an expanded network of diffusion tube samplers, and identified that the objective would be met at all relevant locations. The revocation order was issued in 2008. Although a draft Action Plan was prepared in 2004, it does not appear to have been completed and there is no evidence that any of the proposed measures were ever implemented.
- **Rushmoor DC:** The first round of Review and Assessment concluded the need to declare an AQMA between junctions 4 and 4a of the M3 motorway; the order was issued in October 2000. A subsequent Stage 4 study was completed based on modelling; this study concluded that the nitrogen dioxide levels would not exceed the objective and the AQMA was revoked in 2002. There is no evidence that an AQAP was prepared prior to this revocation⁴ or that any local measures were ever implemented.
- **Hertsmere DC:** The first round of Review and Assessment identified potential exceedences of the annual mean objective for nitrogen dioxide in the vicinity of the M25 and M1 motorways, and 14 AQMAs were declared on the outcome of the Stage 3 report. The subsequent Stage 4 review and assessment included more detailed modelling and recommended revocation of 11 of the 14 AQMAs. An AQAP was prepared, and the authority currently has 6 AQMAs, but the action plan measures were not related to the decision to revoke.

⁴ The Action Plan that was prepared was not published until 2006 and was related to subsequent re-declaration of the AQMA.

- **Stockport MBC:** The first round of Review and Assessment identified likely exceedences of the annual mean nitrogen dioxide objective coinciding with the main arterial routes of the A6, A34 and the M60. The subsequent 2003 USA identified a further review was needed for exceedences of the annual mean objective, and this confirmed the original AQMA, but with amendments. The original AQMA was thus revoked and revised.
- **Tewkesbury DC:** The first round of Review and Assessment identified the need to declare an AQMA in an area surrounding the M5; this was declared as an AQMA by both Tewkesbury DC and Stroud DC as part of the Gloucestershire partnership (June 2001). More extensive monitoring was carried out, together with modelling studies conducted by the Highways Agency. It was concluded that it was unlikely that the objective would be exceeded. Although an Action Plan was prepared, there is no evidence that any of the proposed measures were ever implemented.

2.38 It is concluded from the above analysis that, to date, there is no evidence that local AQAP measures have played a major role in the revocation of nitrogen dioxide-related AQMAs, and this cannot be used as a metric to determine the benefits of the system so far. However, it must be emphasised that this does not mean the current AQAP measures will not assist in the future revocation of AQMAs, as the system has matured, and number and types of measures implemented has expanded. In addition, if the expected benefits associated with the introduction of Euro 6/VI vehicles materialises, the efficacy of many AQAP measures will be improved.

Summary Conclusions from WP1

The summary conclusions from WP1, in direct response to the questions posed by Defra, are set out below.

a. To what extent have the proposed measures in the action plan been implemented, and what have been the principal barriers/drivers to implementation?

Within the 20 Case Studies examined, the majority of measures identified in the Action Plan have been implemented; this is particularly the case for those measures which are under direct local authority control.

The key driver to successful implementation has been the close involvement of stakeholders (both within and outside the local authority, as appropriate) and local politicians. Incorporation of the AQAP into the LTP process has also proven to be very successful.

The key barriers to implementation have been concerns related to economic displacement (associated with a lack of political will and support), lack of funding for large infrastructure projects, and inadequate resources.

b. To what extent have individual measures, or packages of measures, been quantified (as either emissions or concentration reductions), and has the approach been taken robust?

There is little evidence within the Action Plans reviewed that any robust quantification of the reductions due to the measures introduced has been conducted, in terms of either emissions or concentrations. The key barrier to this has been limitations in terms of cost and resources. Other issues include a lack of suitable detail of fleet composition and projections at the local level, and concerns regarding the reliability of current NO_x emissions. There are also difficulties in quantifying the benefits associated with the “soft measures” such as travel plans, cycling schemes etc.

c. To what extent have the implemented measures been successful in reducing emissions/concentrations, and/or in revoking AQMAs, and what would have been the likely implications to ambient air quality and national emissions had local authority action planning not been implemented?

Due to the lack of robust quantification of the implemented measures it is difficult to assess how effective Action Plans have been in reducing NO_x emissions, although improvements must have been achieved. In terms of reducing nitrogen dioxide concentrations, there is little evidence of any widespread decline in levels as a result of Action Plan measures, and in some areas concentrations are increasing.

In terms of AQMAs (related to exceedences of the annual mean objective/limit value for nitrogen dioxide) there is no evidence that AQAP measures have directly resulted in the revocation of an AQMA. However, there is some evidence that the action planning process

has played a significant role in providing the evidence base to support or influence local measures that have delivered improvements to local air quality. Had the AQAP not been in existence, these measures may not have been implemented in a manner that delivered air quality improvements, or may have been delayed. Whilst these measures have not yet succeeded in revocation of the AQMA (either because there has been insufficient time to judge performance, or the scale of the AQMA is too large) a substantial improvement has been achieved.

There are also other benefits arising from the action planning process that are not directly reflected in terms of emissions/concentrations reduction. For example, local authority officers are better informed to provide advice on development control decisions, thus preventing or mitigating against new developments that could worsen air quality, or introduce additional exposure into areas of poor air quality.

d. To what extent has the success of the implemented measures been hampered by issues beyond the authorities' control e.g. the on-road performance of vehicles as compared to the emissions forecasts, increases in traffic flows etc.?

The majority of the action plan measures fall into the broad categories of demand management (i.e. reducing road traffic) or the introduction of cleaner (low emission) vehicles. Clearly, any benefits associated with the latter will have been significantly hampered by the failure of the more stringent Euro standards to deliver the expected improvements.

A more important factor though, relates to the scale of the problem which local authorities face, and the extent to which local measures can be expected to deal with these. At the time the 1997 National Air Quality Strategy (NAQS) was published, it was expected that national policies would deliver the air quality objectives at most locations across the UK, other than at a small number of "hotspots". The NAQS envisaged that where progress in achieving the objectives was slow, that the "*proper response should be at the local level and the primary responsibility for developing programmes of action should rest with local authorities*" – the LAQM regime was thus designed to identify and tackle air quality problems in these isolated hotspots. The reality for most local authorities has been very different, and as opposed to trying to reduce nitrogen dioxide concentrations by a small amount, at an isolated number of hotspots, the margin of reduction required is substantial, and is evident across large areas.

3 Work Package 2

3.1 This Work Package focusses on the alternative approaches that could be used to improve the effectiveness of the action planning process, and considers the implications of such changes for LAQM practitioners. It also considers potential approaches to action planning to deliver improvements to air quality in areas where the objectives/limit values are not exceeded.

WP2a: Identification and Assessment of Alternative Approaches

3.2 Following an initial screening process, and discussions with Defra, five areas for further investigation were identified:

- The use of an emissions-driven approach;
- The development of guidance that presents “standardised” packages of air quality measures;
- The development of national frameworks relating to the implementation of well-defined action plan measures;
- The integration of air quality measures into policies and measures related to climate change and development control; and
- Modification of management roles and responsibilities.

3.3 A brief introduction to each of these alternative approaches is given below, together with an assessment of the potential strengths and weaknesses of each. A more detailed assessment of the alternative approaches is then provided in WP2b.

3.4 It should be noted that these alternative approaches are focused towards AQMAs with exceedences of the annual mean nitrogen dioxide objective/limit value. The current action-planning process with respect to other pollutants and sources has generally worked well, and there appears to be no justification for change.

Use of an Emissions-Driven Approach

3.5 A principal conclusion arising from Work Package 1 is that while many local authorities have developed and implemented detailed action plans, there is little evidence to date that the measures within these plans have been successful in reducing concentrations of nitrogen dioxide. There are a number of factors that have contributed to this:

- Quantification of the emission or concentration reductions is complex; it usually requires an initial quantification of the transport effects of the measure (in terms of modal shift, traffic flows, changes in vehicle speeds etc.), quantification of the effects on emissions (which can be

subject to considerable uncertainty) and then, if concentrations are to be quantified, detailed dispersion modelling;

- Local authorities often have limited direct control over many sources of emissions;
- It is difficult to “sell” the message to non-air quality specialists, as the issues are complex, and often the air quality benefits (expressed as a reduction in annual mean nitrogen dioxide concentrations) are small;
- There are local, political and economic barriers to the implementation of those measures that might be most effective in improving air quality; and
- The expected benefits associated with the introduction of higher Euro-standard vehicles, has not materialised. This has affected both baseline concentrations, which had been expected to decrease, and the effectiveness of those action plan measures built around early introduction of vehicles built to meet recent Euro standards.

3.6 The adoption of a purely emissions-driven approach to action planning seeks to overcome some, but not all, of these obstacles. In addition, the approach could be beneficial in achieving the aims of other policy measures, such as generally lowering background pollutant concentrations which would assist in meeting the annual mean objectives/limit values for nitrogen dioxide, the PM_{2.5} exposure-reduction targets, the obligations under the National Emissions Ceiling Directive, and in reducing emissions of greenhouse gases (although the latter does not always automatically follow). The Low Emissions Strategies Partnership (LESP) has produced a guidance document “*Low emissions strategies: Using the planning system to reduce transport emissions*” but by definition, this only covers a proportion of the measures that local authorities may need to consider in their Action Plans, i.e. those associated with new developments.

3.7 There are two potential approaches that could be used for an emissions-driven approach. These would be an “authority-wide” approach and a “hotspot-targeted” approach. The first approach seeks to implement a “low emissions strategy” across the entire local authority area; the second approach seeks to target the “low emissions strategy” to the AQMA. A summary of the various advantages and disadvantages of each is provided in Box 1.

Box 1: Summary of Advantages and Disadvantages of an Emissions-Driven Approach

Advantages	Disadvantages
Authority-wide Approach	
Potentially much easier for a local authority to implement, and no need to undertake complex dispersion modelling studies. Local authorities are already quantifying emission reductions for greenhouse gases from selected sources. Helps integration of climate change and local air quality issues. Assists in identifying co-benefits and conflicts or trade-offs	If emissions reduction targets were set, this would require detailed emissions inventories to be developed and maintained for all local authorities. Unlike concentrations, emissions reductions cannot be directly measured

Could be adopted by all local authorities, even those without AQMAs.	
Approach is adaptable to a wide range of pollution sources.	Lack of reliability in vehicle emissions factors could potentially over-estimate benefits, or potentially drive forwards inappropriate measures.
Avoids “displacement” of emissions within the local authority area (as may occur if only hotspots are targeted). NB: displacement could still occur between neighbouring authorities	Overall emissions reduction may have little or no impact on hotspot areas, may preclude certain measures that would be very effective in reducing local concentrations, or could potentially increase pollutant concentrations at local hotspots.
Supports overall reduction in emissions and contributes to NECD and greenhouse gas emissions reduction targets and PM _{2.5} obligations for exposure-reduction.	A system would need to be developed such that local reductions would be captured by the current reporting system for the NECD.
Easier to gain support at the local political and public levels as not reliant on demonstrating reduction in pollutant concentrations. Easier to communicate the issues with local transport and development control planners	Outcome is removed from the critical indicator of success (i.e. compliance with the objectives/limit values). Unless an emissions-reduction target were set, it would be difficult to judge whether an authority had done enough. There may be a potential for authorities to focus on those emissions over which they have direct control, and shift away from influencing other sectors.
Hotspot Approach	
Potentially much easier for a local authority to implement, and no need to undertake complex dispersion modelling studies. Scope of reduction is targeted upon local hotspots.	Limited impact on driving down overall emissions. Depending upon local circumstances, emissions arising from outside of the “hotspot area” may make a substantial contribution to the problem.
If a concentration target were retained (as an alternative approach) there would be no need to set an emissions-reduction target	The problem with small (if any) improvements to concentrations would remain, and may be hidden by substantive local reductions in emissions which only lead to small reductions in concentrations.
Easier to gain support at the local political and public levels if communication of the AQAP (and its outcome) were focused on emissions reduction.	May cause “displacement” of emissions from the hotspot into surrounding areas. This could potentially lead to new exceedences, or to no net reduction in emissions.

Guidance on Standardised Packages of Measures and Development of Tools

- 3.8 An outcome from WP1 is that local authorities have expended considerable effort in drawing together Action Plans, and, in line with Defra Policy Guidance (LAQM.PG(09)), the authorities have usually attempted to consider all of the potential options open to them, starting from scratch in carrying out this process. This has frequently resulted in an Action Plan that is too generalised, and which includes far too many measures. It has also greatly increased the time taken to formulate, agree and implement the Action Plans.
- 3.9 The development of “standardised” packages of measures that have been proven to work elsewhere could reduce much of this burden. A summary of the various advantages and disadvantages of this approach is provided in Box 2.

Box 2: Summary of Advantages and Disadvantages of Standardised Packages of Measures and Development of Tools

Advantages	Disadvantages
Provides a reduced burden for local authorities “starting from scratch”. Brings more of a focus on implementation of measure(s) rather than developing a plan.	Any standardised package would need to be flexible enough to be adapted to local circumstances.
Potential to substantially reduce the time for implementation of measures. Packages could be supported by nomograms or spreadsheet tools based on multiple assessment runs conducted by Defra	Any tools would need to take sufficient account of the potential for local variations, and allow user modifications to be made.
Potential to reduce the need for local quantification of measures if examples of likely benefits included in the package.	As above

Development of National Frameworks

- 3.10 The concept of national frameworks for action-planning measures is different from the standardised packages described above. Each national framework would provide a detailed method for the implementation of a single, well defined, measure (e.g. LEZs, freight-recognition schemes, Supplementary Planning Guidance etc.) including legislative requirements, emissions standards, etc. There is also potential for Defra to provide guidance, with a supporting package of material, to assist local authorities in communicating the importance of air quality issues, with direct and clearly understandable links to the health effects. A summary of the various advantages and disadvantages of this approach is provided in Box 3.

Box 3: Summary of Advantages and Disadvantages of National Frameworks

Advantages	Disadvantages
Provides a reduced burden for local authorities “starting from scratch”. Brings more of a focus on implementation of measure(s) rather than developing a plan.	The framework would have to be sufficiently flexible to be adapted to local circumstances.
National frameworks could encourage local authorities to implement a measure, and provide the evidence base for stakeholders.	May engender local resistance if measure is seen as being imposed on the authority.
Potential to remove barriers associated with local economic concerns, such as comparisons between neighbouring authorities	Local opposition to implementation of “national” measures that are not specifically tailored to local needs.

Better Integration into the Climate Change and Development Control Agendas

- 3.11 There are particularly strong synergies between the measures that could be taken to reduce emissions of climate-forcing pollutants (in particular CO₂ and black carbon) and air quality objectives, such as generally lowering background pollutant concentrations which would assist in meeting the annual mean objectives/limit values for nitrogen dioxide, reducing PM_{2.5} exposure, and meeting the obligations under the National Emissions Ceiling Directive.

- 3.12 Whilst the air quality improvements associated with climate change policies are often stated, these co-benefits are often seen as “advantageous” but not “critical”. If obligations to reduce emissions of both NO_x and PM were strengthened within the drivers for climate change, there would be significant benefits. As local authority climate change policies relate to a wider geographical scale (i.e. whole local authority areas) there is a better fit than with measures to eliminate pollution hotspots. There is also potential to strengthen these obligations within the development control regime which would benefit both climate change and local air quality. A summary of the various advantages and disadvantages of this approach is provided in Box 4.

Box 4: Summary of Advantages and Disadvantages of Climate Change and Development Control Integration

Advantages	Disadvantages
Measures to reduce emissions of CO ₂ (and black smoke) will, in most cases be beneficial to reducing NO _x and PM.	Not all climate change measures will reduce urban PM _{2.5} concentrations (e.g. promotion of biomass in industry and commercial/residential development)
The scale over which climate change policies operate is consistent with the need to reduce urban exposure to PM _{2.5} .	
There is already significant pressure on local authorities via DECC and LGA to assess and reduce emissions of greenhouse gases, which has the potential to provide support and cross-linkages to the emission reduction metric explained in section 3.5.	Calculations of emissions used to enforce compensation within the development control regime will need to be robust and transparent

Modification of Management Roles and Responsibilities

- 3.13 The implementation of Action Plan measures has generally been more successful when related to issues that are under direct local authority control. In particular, for non-unitary authorities, or where issues are primarily related to major trunk roads, the required measures can only be effectively driven by those responsible for transport planning. Even though the integration of Action Plans into the LTP system has in many cases proved successful, there are still obstacles that need to be overcome. A summary of the advantages and disadvantages of this approach is provided in Box 5.

Box 5: Summary of Advantages and Disadvantages of Modification of Management Roles and Responsibilities

Advantages	Disadvantages
Formal obligations on those organisations with direct control of the emissions would ensure that measures to improve air quality are developed and taken forwards.	A “shared responsibility” between the local authority and the organisation responsible for transport planning could lead to disagreement and lack of action.
	Measures that could potentially improve air quality on major trunk roads (e.g. displacement of traffic) could worsen air quality elsewhere.

Removal of Action Planning Obligations

3.14 Within the various alternative approaches considered in this study, an option to completely remove the obligation on those local authorities with AQMAs to prepare and implement an Action Plan has not been explicitly considered. Whilst evidence to date suggests that local authority Action Plans have not delivered widespread reductions in annual mean concentrations of nitrogen dioxide, it is not thought appropriate to remove the obligation for the following reasons:

- Whilst this was not a question put directly to the Case Study authorities, there appeared to be no widespread desire amongst local authority officers to have such obligations removed.
- The local authority Action Planning process has undoubtedly been severely hampered by the actual on-road performance of vehicles as compared with the projections based on the Euro standards. Whilst the 1997 NAQS expected that national policies would deliver the air quality objectives in most locations across the UK, leaving local authorities to focus on relatively isolated hotspots, the reality has been very different, and the scale of reduction required can, in many instances, only be achieved by substantial modal shifts or a substantial reduction in tailpipe emissions (via improved emissions reduction or a shift to hybrid/electric vehicles).
- Whilst Action Plans have not generally been successful in attaining the air quality objectives, this does not infer that they are worthless. A number of success stories have been identified, and the development of Action Plans continues to provide a strong evidence base as a driver for other policies and initiatives, and provides an important link to the development control process.
- With the expected improvements associated with the introduction of the Euro 6/VI standards, the momentum that has been established will be well placed to deliver the improvements originally envisaged within the 1995 Environment Act.

3.15 For the reasons stated above, it was not deemed necessary to consider this option further.

WP2b: Assessment of Alternative Approaches

Use of an Emissions-Driven Approach

3.16 From the outcome of the On-line Survey and Sounding Board interviews, it is clear that there is considerable support amongst local authorities for an emissions-driven approach – and in fact a number of authorities stated that they have been working to this model for many years, although it was not explicitly labelled as such. The experience of local authorities is that it is easier to communicate the roles and benefits of Action Plan measures, in terms of reducing emissions, to transport and development control planners, and to local politicians, as opposed to focussing on concentrations.

- 3.17 However, there was also a unanimous response from local authorities that the concentration target should be retained, as it is the primary link to public health.
- 3.18 Whilst it is recognised that all local authorities could benefit from the introduction of low emissions strategies, and that encouragement from Defra could be provided to do so (in the manner in which Air Quality Strategies are promoted in the LAQM Policy Guidance) it is not recommended that this approach should replace the current LAQM process. To set emissions-based targets for local authorities (even for only those with AQMAs related to exceedences of the annual mean objective/limit value for nitrogen dioxide) would be a substantial task, as robust emissions inventories are only available for a very small proportion of authorities – there is no straightforward manner in which emissions metrics could be derived in an equitable manner. Potentially, such metrics could be set in terms of emissions arising from the authority’s own estate⁵, but this would ignore the significant contributions that local authorities have delivered by working with other stakeholders; metrics could also be set based on assumptions regarding road traffic flows in local authority areas, but any such calculations would be subject to considerable uncertainty. In the absence of such targets or metrics, it would not be easily possible to judge whether an authority was taking sufficient action.
- 3.19 A “hybrid option” for an emissions-driven approach is therefore recommended. This would retain the concentration target for local authorities (an aspect unanimously supported by the authorities contacted as part of this project), but would focus delivery of the Action Plan measures on emissions reduction. It is further recommended that the emissions-driven approach be primarily targeted at the areas of exceedence – for some authorities this would encompass the entire authority area, whilst for the majority it would include a small proportion of the road network. The emissions reductions should be quantified in absolute terms (e.g. kilograms of pollutant over a defined time period) and for a defined spatial area.
- 3.20 An emissions-driven approach needs to be supported by appropriate guidance and tools provided by Defra, and this links to the development of standardised packages, tools and national frameworks that are discussed below.

Guidance on Standardised Packages of Measures and Development of Tools

- 3.21 The development of Technical Guidance for Review and Assessment (LAQM.TG(09)) has often been praised in setting out an overarching approach to be followed by local authorities, and while prescriptive in many aspects it allows sufficient flexibility for adaptation to local needs. It is the absence of equivalent guidance to local authorities on the development of Action Plan measures

⁵ Many LAs are already calculating CO₂ emissions from their own estate, which commenced with N185 reporting and is continuing with DECC/Defra GHG reporting methods. These data could be used to generate NOx/PM emissions inventories.

that has contributed to stagnation in the process, considerable delays in implementation, and lack of progress.

3.22 The development of various nomograms and spreadsheets in TG(09) has allowed local authorities to undertake screening assessments of air quality in their areas without the need to resort to expensive modelling assessments or the use of external consultants. Such tools have been developed at a national level by incorporating a wide range of assumptions into the tests, and could be developed further to provide better guidance to local authorities preparing Action Plans.

3.23 It should be possible to generate information on expected improvements to traffic flows, reductions in congestion etc., associated with various measures, and taking into account different road conditions (flows, vehicle types, road characteristics etc.). From these improvements, it would then be possible to estimate the expected improvements in terms of emissions reductions. The availability of such a tool would allow authorities to carry out initial screening evaluations of the most effective measures⁶. There are a number of currently available tools or initiatives that can deliver this type of information. For example:

- Drakewell offer real time road transport emission estimates, which are automatically derived directly from traffic count points. The use of more sophisticated traffic collection systems, such as Automatic Number Plate Recognition (ANPR), then allows post-processing to give more accurate emission estimates (as more detailed information can be obtained - vehicle ages, the use of petrol or diesel, engine sizes etc.).
- The Low Emission Strategy Partnership have made available a tool (the Low Emission Toolkit) that allows the detailed assessment of emissions from road vehicles, and the ability to assess a wide range of different scenarios that can be applicable to the action planning process (introduction of low emission vehicles, evaluation of captive fleets, the impacts arising from developments etc.).
- DfT hold information on the relationship between different interventions, such as the expected impact on localised traffic flows from the promotion of cycling schemes. Some of the linkages between the air quality and transport community need to be strengthened to deliver the required information in an efficient way.

3.24 Better use should be made of the information that is already available in providing guidance to local authorities on measures that have been successfully implemented elsewhere⁷. Whilst examples of “Good Practice” and “Case Studies” are available on the Defra LAQM Support website, little has been done to distil the important information in a readily-understandable manner,

⁶ The DfT Basic Carbon Tool <http://www.dft.gov.uk/publications/local-authority-basic-carbon-tool/> could potentially be adapted for this purpose

⁷ Information provided could be usefully shared onto the LGA “Knowledge Hub” <http://www.local.gov.uk/knowledgehub>

and the proven benefits of the measures in terms of reducing emissions are neither quantified nor stated. A clear distinction needs to be drawn between what is considered to be “good practice” and the measures that are known to have been effective.

- 3.25 There has been no evidence arising from this study that the “Best Practice Guidance” documents published by Defra have been widely (if at all) used, as they are seen to be overly complex. The recent allocation of Defra grant funding affords an opportunity to redress this balance, as the focus has been upon Action Plan measures. The outcomes of these studies, and the tools and models generated, need to be evaluated and distilled at a national level to provide more appropriate guidance to local authorities on what measures work in practice.
- 3.26 There is also an opportunity for further development of existing guidance, to provide better information on the emissions reduction potential of certain types of measures. As an example, the DfT *Sustainable Travel and Environment* website⁸ provides information on issues such as biofuels and smarter choices, but includes no link to, or assessment of, the emissions reductions that might be associated with their implementation.

Development of National Frameworks

- 3.27 The development of national frameworks is intended to provide local authorities with “ready-made” packages of measures that could be implemented within shortened timescales. The key elements of a national framework are:
- **The framework will be seen to be Defra-endorsed** – (and potentially DfT endorsed) this will encourage local authorities to participate;
 - **The framework, and the local authorities that participate in it, could be widely publicised** – widespread uptake of the frameworks will encourage more local authorities to participate;
 - **The framework will be “inclusive” in that all of the elements required for local implementation are covered** – this should cover all facets that are likely to be required such as setting of standards, guidance of legislation;
 - **The framework will provide a uniform approach to implementation, whilst allowing local authorities to select specific components for adapting to local needs** – the inclusion of uniform standards will avoid the need for local decision-making and will be more attractive to stakeholders e.g. transport operators etc.
- 3.28 It is envisaged that national frameworks could be developed over time on an “as-needed” basis, but some suggestions are set out below:

⁸ <http://www.dft.gov.uk/topics/sustainable/>

- 3.29 **Low Emission Zones:** Whilst Defra has published useful guidance to assist local authorities in the development of LEZs, the guidance is generic, as opposed to being a prescriptive framework. A particularly important aspect of the framework would be to set minimum emissions standards for different vehicle types – this would allow flexibility as to whether the LEZ was targeted at e.g. HGVs, buses etc., but would avoid the need for local decisions on minimum standards.
- 3.30 **Freight Recognition Schemes:** The Ecostars scheme has been successfully introduced into Sheffield, but there has been less success in the uptake of this approach across the UK. Feedback from the On-line Survey and Sounding Board suggested that this had been difficult to implement as (a) other freight recognition schemes (that do not address NO_x emissions) are in place), and (b) it has been difficult to secure local agreements on what emissions standards should be applied. It is further considered that a UK-wide approach⁹ would be attractive to national fleet operators who do not want to have to comply with different schemes in different areas.
- 3.31 **Communications:** Feedback from the On-line Survey and Sounding Board has highlighted the difficulties of raising the importance of the health effects of air pollution exposure at the local level, to politicians, local businesses and the general public. This is a key issue if support to the implementation of Action Plan measures is to be gained. Whilst there are a number of good examples of local authority communication initiatives¹⁰, developing these initiatives at a local level requires both substantial effort and resource, and takes considerable time to develop. Much could be done to provide a national package of communications materials that could be adapted to local use.
- 3.32 **Supplementary Planning Guidance:** There is the opportunity to provide a national framework and guidance on Supplementary Planning Guidance to local authorities, focusing on the need to minimise emissions¹¹. This would aim to set a uniform approach for the calculation of emissions and financial compensation for unmitigated emissions.

Better Integration into the Climate Change and Development Control Agendas

- 3.33 Local authorities play an important role in reducing emissions of greenhouse gases through a variety of actions that they take (managing their own estates, development control practices etc.). As the scale on which local actions on climate change are authority-wide, there is significant potential to provide and encourage more pro-active links between climate change and local air quality interactions. This would assist in reducing overall emissions of pollutants such as NO_x and PM, in support of the obligations under the NECD, and in support of meeting the PM_{2.5} exposure-reduction obligations within the EU Directive.

⁹ The Ecostars Europe (www.ecostars-europe.eu) scheme is currently under development and could be adopted by Defra.

¹⁰ <http://www.care4air.org/>, www.cityoflondon.gov.uk/cityair

¹¹ The Low Emissions Strategy Partnership had developed SPG guidance which could be adopted by Defra.

- 3.34 Some thought is needed regarding the most appropriate way of ensuring effective co-ordination between the AQ and climate change fields at the local level to facilitate the delivery of air quality initiatives. It is not expected that co-ordination would be implemented through the LAQM Action Planning process, but it may be that some type of formal obligations on local authorities is required to ensure that actions are taken to deliver benefits.
- 3.35 Capturing and collating information on local activities that impact on emissions will also need some consideration. It is important because the information is needed for incorporation into national level activities such as the national emission inventory estimates. The impacts of most local initiatives may be reflected in reductions in e.g. fuel consumption, which is reflected in the NAEI emission estimates. But there may be other local interventions that reduce e.g. emission factors, which would not be automatically included in the national level emission estimates and reporting¹².

Modification of Management Roles and Responsibilities

- 3.36 The Environment Act 1995 places a clear responsibility for delivering the LAQM process onto local authorities. However, whilst local authorities are well placed to undertake the Review and Assessment component of this process, the development and implementation of the Action Plan component frequently requires interaction with other organisations. This is particularly the case for non-unitary authorities, and for authorities with major trunk roads, as the responsibilities for traffic management (the major contributor to most air quality problems) lies with other organisations (the County Council and/or the Highways Agency). While the integration of Action Plans into the LTP process has proved beneficial in many cases, there is no formal requirement to do this (only an expectation), there are no specific air quality targets within LTP3, and there is no statutory obligation upon those authorities preparing the LTP to address air quality problems within AQMAs. The Highways Agency¹³ has committed to working with local authorities in the preparation of Action Plans, and is committed to “*not progressing road schemes that would worsen the air quality situation overall*”, but there is no statutory obligation.
- 3.37 LTP3 was required to be in place by April 2011, and there is now limited opportunity to influence their development.
- 3.38 One difficulty of placing responsibility on County or HA is that this then becomes a “shared” responsibility, which has the potential to cause complications. The provision of guidance on the way that this is implemented in practice would be a helpful addition, perhaps with the inclusion of specific case studies.

¹² There is already some work on this to assess the impact of local authority measures on national emissions estimates (G A Hitchcock and T A Mitchell, 2010).

¹³ <http://www.highways.gov.uk/knowledge/18550.aspx>

WP2c: Implications for Local Authority Practitioners

- 3.39 The proposed changes to the current Action Planning process, as set out above, are principally founded on providing better central resources and guidance to local authorities, as opposed to any fundamental change in the LAQM process. As such, there are no major changes to the existing tools and Technical Guidance required. Within the Action Planning process itself, the proposed changes impart no additional burden on local authorities, although it is suggested that local authorities could take a more pro-active approach to reducing emissions of NO_x and PM through better interaction with the climate change and development control mechanisms.
- 3.40 It is not possible to precisely quantify the benefits of the proposed changes, but the following improvements are expected:
- **There should be substantial reductions in the effort and time required to develop the Action Plan.** Whilst retaining the annual mean objective for nitrogen dioxide, local authorities are not expected to explicitly quantify the effects of their Action Plan measures in terms of concentrations. A range of expanded tools, standardised packages, and national frameworks will allow easier identification of measures that work, provide the basis for simple quantification of the benefits to pollutant emissions
 - **There should be substantial reductions in the time between the development of the Action Plan and implementation, and the effort required for implementation.** A range of standardised packages and national frameworks should encourage uptake and minimise the necessity for local negotiations
 - **There are considerable opportunities to deliver improvements to air quality through better targeting of climate change actions, and integration into the development control process.** Prioritisation of climate change measures that reduce emissions of PM and black carbon would deliver substantial co-benefits.

WP2d: Modification of Action Planning to Deliver Improvements to Air Quality at Levels Below the Limit Values

- 3.41 In considering potential modifications to the action planning process and resulting benefits, it was considered sensible to consider areas exceeding limit values in parallel with area below the limit values. As a result, this specific topic has been incorporated into a number of sections of the report, and included above.

Summary Conclusions from WP2

The summary conclusions from WP2, in direct response to the questions posed by Defra, are set out below.

a. What alternative management approaches could be used for the development of Action Plans;

A number of management approaches for the development of Action Plans are proposed, which are intended to assist and enhance the current process as opposed to replacing it with a new model. In particular, whilst the Review and Assessment component of LAQM is supported by concise, prescriptive guidance that can be adapted to local needs, the guidance provided to support Action Planning is seen to be overly-complicated or incomplete (in that it does not link measures with emissions reduction). Action Plan development founded on tools that allow simple quantification of measures, standardised packages (based on measures that are known to work) and National Frameworks should permit Action Plans to be developed and implemented in shorter time periods and encourage the uptake of measures proven to reduce emissions at the local level.

b. What would be the implications for the review and assessment approach of introducing an “emissions driven” approach for action planning;

An emissions-driven approach could be implemented at a number of different levels. If it were to wholly replace the obligation on local authorities to work in pursuit of the objectives, then there would be a requirement to set emissions-based targets, which would be a difficult process for many local authorities (where authority-wide emissions inventories do not exist). If the objectives were retained, but the focus of the Action Plan were upon emissions reduction, this would allow easier quantification of measures and improve communications with relevant stakeholders, local politicians and members of the public.

c. What additional training and skills would be required to implement the changes, and what implications could this have on successful delivery;

The principal obligations of the modified approaches fall largely upon Defra, and so there is a minimal burden to individual local authorities.

d. Could the Action Planning process be modified to deliver improvements to critical pollutant concentrations which are below the objectives/limit values?

It is considered that the Action Planning process is not the best vehicle to deliver improvements to pollutant concentrations (principally PM_{2.5}) where levels are below the objectives/limit values. In some authority areas this approach could be successful (as the AQMA boundary encompasses the entire local authority area) but in the majority, where the areas of exceedence are often limited to within close proximity of the major road network, or even to single junctions, it would be better to provide stronger interactions to the climate change and development control agendas.

4 Work Package 3

- 4.1 This element of the study is concerned with the review and assessment reporting cycle and obligations imposed on local authorities, with the aim of reducing burdens where appropriate.
- 4.2 The Environment Act 1995, and the Environment (Northern Ireland) Order 2002, places an obligation on local authorities to review and assess air quality in their areas “from time to time”. Where it is considered likely that the air quality objectives will not be achieved, then the authority must designate an Air Quality Management Area. There is an additional obligation on local authorities that designate Air Quality Management Areas to undertake a Further Assessment of the air quality conditions within 12 months of the AQMA Order.
- 4.3 These obligations have been translated into the current Review and Assessment timetable which is based on a three-year rolling programme, with an Updating and Screening Assessment (USA) required every three years, and Progress Reports required in the intervening two years. A Further Assessment is required to be prepared within 12 months of designating an AQMA and a DA should be prepared at any time if evidence arises that one is needed.
- 4.4 It is, however, recognised that there is little risk of the air quality objectives/limit values being exceeded in some local authority areas. Placing obligations on these authorities to produce regular and largely repetitive reports is potentially a misuse of scarce resources, and diverts attention at a national level from tackling the real problem areas where achievement of the objectives/limit values remains a challenge. In addition, although completion of the Further Assessment is a statutory requirement, as defined in the Act, this often adds little to the process and its conclusions could potentially be incorporated into other elements of LAQM reporting, if required at all.
- 4.5 A further consideration is whether the ongoing requirement to prepare an Updating and Screening Assessment every three years is necessary, pending a significant change to the LAQM.TG(09) Technical Guidance (or related FAQs).
- 4.6 An alternative approach to the current system of Review and Assessment, removing all obligations from local authorities to identify exceedences of the objectives, and instead placing reliance on the national assessment, is also explored.

The Reporting Cycle for Review and Assessment

- 4.7 A review of the outcome of review and assessment reports prepared by selected local authorities since the inception of the LAQM process has been carried out. These authorities were selected by applying the following criteria:

- No AQMA had ever been declared; and
- No Detailed Assessment had ever been submitted.

4.8 A total of 55 authorities were identified as meeting these criteria, from which 18 local authorities were selected for analysis. These were chosen to give a geographical representation across the UK, and a mixture of authorities of different sizes, in rural and semi-rural areas; the authorities selected are shown in Table 3.

Table 3: Local authorities selected for review of reporting burden

Allerdale Borough Council	North Norfolk District Council
Christchurch Borough Council	Richmondshire District Council
Craven District Council	Rutland Council
Fermanagh District Council	Stafford Borough Council
Gwynedd Council	Stevenage Borough Council
Harlow District Council	Tandridge District Council
High Peak District Council	Torfaen Borough Council
Mole Valley District Council	Wealden District Council
North Ayrshire Council	West Somerset Council

4.9 The review took account of the following issues:

- Outcomes of the reports since the inception of LAQM in circa 2000;
- The degree of repetitiveness in the reports;
- Sources of pollution in each local authority area;
- Monitoring carried out by the local authority; and
- The amount of “headroom” between the annual mean air quality objective value for nitrogen dioxide and the maximum measured (or modelled) concentration at relevant locations¹⁴.

4.10 The details of the analysis are shown in Appendix 3. A number of general conclusions can be drawn from the assessment:

- Many rural local authorities have potentially significant pollution sources (motorways and trunk roads). Measured concentrations close to these sources can exceed the annual mean objective for nitrogen dioxide, but there is currently no relevant exposure;
- The majority of local authorities maintain monitoring networks (ranging from small numbers of nitrogen dioxide diffusion tubes, to the use of automatic instruments);

¹⁴ There are potentially different implications for Scottish authorities where the 2010 objective for PM10 applies, and the headroom is much reduced. These implications are beyond the scope of this report.

- Although no AQMAs have been declared within the authorities surveyed, measured concentrations are variable from year-to-year, and in a number of cases, recent data have identified new areas where the objectives might be exceeded.
- The highest annual mean nitrogen dioxide concentrations (at relevant receptor locations) are generally in the range $30 \mu\text{g}/\text{m}^3$ upwards. Concentrations below this threshold only occur in a small number (three) of the authorities surveyed.

4.11 A number of potential options have been considered:

- To remove all USA and PR reporting requirements for authorities that are able to demonstrate that annual mean nitrogen dioxide concentrations are below a threshold at which there is no risk of exceeding the objective;
- To relax USA and PR reporting requirements (e.g. every two years, rather than every year) for authorities that are able to demonstrate that annual mean nitrogen dioxide concentrations are below a threshold at which there is no risk of exceeding the objective;
- To modify the USA and/or PR reporting requirements for all authorities; and
- To maintain the status quo.

4.12 Directive 2008/50/EC sets Upper and Lower Assessment Thresholds for the annual mean limit value for nitrogen dioxide, below which the assessment and reporting obligations of Government are relaxed. These equate to 80% ($32 \mu\text{g}/\text{m}^3$) and 65% ($26 \mu\text{g}/\text{m}^3$) of the limit value respectively. Setting a threshold of $30 \mu\text{g}/\text{m}^3$ annual mean nitrogen dioxide, below which the reporting requirements could be either removed or relaxed, is a potential option. It would clearly be necessary for a local authority to make a robust case for this, demonstrating that concentrations at the worst-case relevant location were below this threshold.

4.13 However, the following issues are raised:

- Only a small number of authorities would be affected by this change (only 55 authorities across the UK have never completed a Detailed Assessment, and only a small proportion of these would have concentrations below the suggested threshold¹⁵);
- If the reporting requirements were removed, there is potential that some local authorities may cease to carry out monitoring. Even where concentrations are below the objective, these data play a vital role in supporting development control decisions, and in providing information on local air quality conditions to members of the public;

¹⁵ A more detailed assessment of reported annual mean nitrogen dioxide concentrations might be required but is beyond the scope of this report.

- The information provided within the Progress Report forms the basis of a local “state of the environment report” on air quality that could be used for wide dissemination at the local level.

Further Assessments

- 4.14 Guidance on the requirement to complete a Further Assessment is set out in Chapter 7 of LAQM.TG(09) and was drafted in an attempt to reduce the reporting burden on local authorities, but it remains a statutory requirement and must be completed. The value of the Further Assessment is questionable, and in some cases may be responsible for delaying the action planning process as valuable resources are diverted towards further analysis of pollutant concentrations.
- 4.15 It is useful to review the intended purpose of the Further Assessment, as defined in Paragraph 7.02 of LAQM.TG(09). This is provided in Box 6 below.

Box 6: Comments on the Intended Purpose of Further Assessments

Paragraph 7.02 TG(09)	Comment
Confirm their original assessment, and thus ensure that they were correct to designate an AQMA in the first place	The R&A process is now mature, and the decisions upon which AQMAs are designated should be robust at the conclusion of the Detailed Assessment. There should be little need to confirm the need for the AQMA, beyond the ongoing process of preparing annual Progress Reports
Calculate more accurately what improvement in air quality, and corresponding reduction in emissions, would be required to attain the air quality objectives within the AQMA	An approach that moves away from specifically chasing the target of achieving the objectives, and towards implementing a package of measures that will achieve a reduction in emissions (whilst retaining the objective as an ultimate indicator of success) would reduce the need for these calculations to be undertaken
Refine their knowledge of sources of pollution, so that the Action Plan may be appropriately targeted	This knowledge is required, but the evidence base is likely to arise from the Detailed Assessment, or can be incorporated into the Action Plan
Take account of any new guidance issued by Defra and the Devolved Administrations, or any new policy developments that may have come to light since the declaration of the AQMA	If necessary, this can be considered in the annual Progress Reports
Take account of any new developments that were not fully considered within the earlier Review and Assessment work. This might, for example, include the implications of new transport schemes, commercial or major housing developments etc., that were not committed or known of at the time of the Detailed Assessment	If necessary, this can be considered in the annual Progress Reports
Carry out additional monitoring to support the conclusion to declare the AQMA, corroborate the assumptions on which the AQMA has been based, and to check that the original designation is still valid, and does not need amending in any way	If necessary, this can be considered in the annual Progress Reports
Respond to any comments made by statutory consultees in respect of the Detailed Assessment	If necessary, this can be dealt with before the final Detailed Assessment is published and the AQMA designation confirmed.

4.16 On the basis of the evidence set out in Box 6, it is concluded that the Further Assessment adds little or no value to the overall process, and is often responsible for delaying work on the Action Plan development. As it is a statutory requirement within the Environment Act 1995, this would require a modification to the primary legislation.

Use of the National Assessment

4.17 The current LAQM system requires local authorities to carry out regular reviews and assessments of air quality within their areas to identify if there are likely exceedences of the air quality objectives. However, an assessment of likely exceedences of the objectives across the UK is carried out at the national scale, and could potentially replace the local assessment. This would reduce the burden on local authorities to carry out all review and assessment reports, and potentially remove any requirements to undertake local air quality monitoring. It would also allow resources to be focused on the implementation of action plans to improve air quality, rather than on identifying the problems.

4.18 A comparison between the annual mean nitrogen dioxide exceedence areas identified by the national scale assessment, and the outcome of local authority reviews and assessments, has been carried out by Defra. This analysis showed:

- Exceedences of the limit value identified by the national assessment in local authorities where there was no AQMA;
- AQMAs declared by local authorities where no exceedences of the limit value were identified within the national assessment.

4.19 The outcome of this comparison is not surprising as the national scale assessment is designed to meet the assessment criteria in the Air Quality Directive which are different to the approaches required for Local Air Quality Management.

4.20 If the current review and assessment approach were removed, and authorities were required to adopt the outcome of the national assessment, it would potentially be necessary to review the status of a significant number of AQMAs. Given that the exceedences in these AQMAs are supported by local monitoring data¹⁶ this would be a very difficult approach to justify at the local political and public levels.

4.21 If these AQMAs were not revoked, but the outcome of the national assessment was taken into account as well, further AQMAs could be required, thus adding to the existing burden. Considerations such as the differences between required assessment methods for air quality

¹⁶ Much of the local authority monitoring is founded on the use of diffusion tubes, but where measured concentrations are substantially above the objective, the exceedence is likely to be robust.

objectives and limit values would have to be taken into account. It is also likely that on closer inspection, some (if not many) of these additional exceedences would be unjustified.

4.22 A further consequence of removing the requirements for review and assessment is that much of the air quality monitoring currently carried out local authorities could cease, as it would no longer be required to support the LAQM process. As discussed above, this would have additional implications for the development control decision process, and the provision of local air quality information to members of the public.

4.23 On the basis of the above, it is suggested that the current reporting system be revised as follows:

- The obligation to prepare Updating and Screening Assessments should be removed, except in the year following a substantive change to the Technical Guidance. All authorities have now completed a USA based on LAQM.TG(09) and there should be no benefit in repetition of this exercise;
- The obligation to prepare a USA every three years, and a PR every intervening year, should be replaced by an obligation to complete a PR in every year, for all authorities. The format of the PR should be modified (in discussion with local authorities) to provide a document that can be easily read and understood by members of the public, and would be suitable for submission to Council members.
- The obligation to prepare Further Assessments adds little, or nothing, to the Review and Assessment process, and is potentially responsible for delaying the development and implementation of Action Plans. It is recommended that the requirements of the Environment Act 1995 are revised to remove the statutory obligation.

Summary Conclusions from WP3

The summary conclusions from WP3, in direct response to the questions posed by Defra, are set out below.

a. Could certain elements of the reporting burden be eased for all local authorities?

The obligation to prepare Updating and Screening Assessments on a three-yearly basis is no longer necessary unless Defra issues substantive changes to the Technical Guidance (e.g. identifying source categories that were not previously considered, or changes to the threshold criteria for the screening assessment). Instead it is recommended that local authorities be required to submit annual Progress Reports in all years. The format of the Progress Reports (for both the Review and Assessment and Action Planning) should be reviewed in consultation with local authorities to provide a document that is of direct use to members of the public and Council members.

The obligation to prepare Further Assessments adds little, or nothing, to the Review and Assessment process, and is potentially responsible for delaying the development and implementation of Action Plans. It is recommended that the requirements of the Environment Act 1995 are revised to remove the statutory obligation.

b. Could certain elements of the reporting burden be eased for those local authorities where pollutant concentrations are well below the air quality objectives/limit values?

There is evidence that annual mean nitrogen dioxide concentrations are well below the objective /limit value in some local authorities, and the USA and Progress Reports that are prepared are repetitive and don't lead to any requirement for action. An annual mean nitrogen dioxide concentration of $30 \mu\text{g}/\text{m}^3$ could potentially be used as a threshold, below which the requirement to undertake Reviews and Assessments could be relaxed (with reporting every 2 or 3 years for example) or completely removed (on the assumption that the local authority does not have any exceedences associated with other pollutants). However, it would be necessary to ensure that the monitoring covered worst-case relevant locations.

c. What risks and benefits might be associated with a reduced reporting burden?

With regard to the removal of the requirement for USAs and Further Assessments, there is little risk, but large benefits to local authorities in saved officer resources which could usefully be deployed elsewhere.

The benefits associated with removing or relaxing the burden for annual reporting on those authorities where pollutant concentrations are well below the objective would only affect a small number of authorities. If the reporting requirements were removed, there is potential that some local authorities may cease to carry out monitoring. Even where concentrations are below the objective, these data play a vital role in supporting development control decisions,

and in providing information on local air quality conditions to members of the public.

5 Conclusions and Recommendations

Summary Conclusions from WP1, 2 and 3

- 5.1 The following are condensed versions of the Summary Conclusion boxes presented at the end of the report sections for Work Packages 1, 2 and 3.

Conclusions from WP1

- a. To what extent have the proposed measures in the action plan been implemented, and what have been the principal barriers/drivers to implementation?**

The majority of measures identified in the Action Plans have been implemented. The key driver to successful implementation has been the close involvement of stakeholders and incorporation of the AQAP into the LTP process. The key barriers to implementation have been concerns related to economic displacement (associated with a lack of political will and support), lack of funding for large infrastructure projects, and inadequate resources.

- b. To what extent have individual measures, or packages of measures, been quantified (as either emissions or concentration reductions), and has the approach been taken robust?**

There is little evidence within the Action Plans reviewed that any robust quantification of the reductions due to the measures introduced has been conducted. The main barrier to this has been limitations in terms of cost and resources (other challenges include uncertain NO_x EFs and assessing the impacts of soft measures).

- c. To what extent have the implemented measures been successful in reducing emissions/concentrations, and/or in revoking AQMAs, and what would have been the likely implications to ambient air quality and national emissions had local authority action planning not been implemented?**

Due to the lack of robust quantification of the implemented measures it is difficult to assess how effective Action Plans have been in reducing NO_x emissions.

There is no evidence that AQAP measures have directly resulted in the revocation of an AQMA, but there is some evidence that the action planning process has played a significant role in providing the evidence base to support or influence local measures that have delivered improvements to local air quality, and that substantial improvements have been achieved.

- d. To what extent has the success of the implemented measures been hampered by issues beyond the authorities' control e.g. the on-road performance of vehicles as compared to the emissions forecasts, increases in traffic flows etc.?**

Benefits associated with the introduction of cleaner (low emission) vehicles will have been significantly hampered by the failure of the more stringent Euro standards to deliver the expected improvements.

However, a more important factor though, relates to the scale of the problem which local authorities face, and the extent to which local measures can be expected to deal with these. The LAQM regime was designed to identify and tackle air quality problems in isolated hotspots. The reality for most local authorities has been very different - requiring substantial concentration reductions across large areas.

Conclusions from WP2

e. **What alternative management approaches could be used for the development of Action Plans;**

The following were proposed, and further investigated:

- The use of an emissions-driven approach;
- The development of guidance that presents “standardised” packages of air quality measures;
- The development of national frameworks relating to the implementation of well-defined action plan measures;
- The integration of air quality measures into policies and measures related to climate change and development control; and
- Modification of management roles and responsibilities.

f. **What would be the implications for the review and assessment approach of introducing an “emissions driven” approach for action planning;**

If this were to wholly replace the obligation on local authorities to work in pursuit of the objectives, then there would be a requirement to set emissions-based targets, which would be a difficult process for many local authorities.

If the objectives were retained, but the focus of the Action Plan were upon emissions reduction, this would allow easier quantification of measures and improve communications with relevant stakeholders, local politicians and members of the public.

g. **What additional training and skills would be required to implement the changes, and what implications could this have on successful delivery;**

The principal obligations of the modified approach fall largely upon Defra, and so there is a minimal burden to individual local authorities.

h. **Could the Action Planning process be modified to deliver improvements to critical pollutant concentrations which are below the objectives/limit values?**

It is considered that the Action Planning process is not the best vehicle to deliver improvements to pollutant concentrations (principally PM_{2.5}) where levels are below the objectives/limit values.

Conclusions from WP3

i. Could certain elements of the reporting burden be eased for all local authorities?

It is recommended that local authorities be required to submit annual Progress Reports in all years instead of USAs. It is recommended that the statutory obligation to report Further Assessments is removed.

j. Could certain elements of the reporting burden be eased for those local authorities where pollutant concentrations are well below the air quality objectives/limit values?

An annual mean nitrogen dioxide concentration of 30 µg/m³ could potentially be used as a threshold, below which the requirement to undertake Reviews and Assessments could be relaxed or completely removed.

k. What risks and benefits might be associated with a reduced reporting burden?

With regard to the removal of the requirement for USAs and Further Assessments, there is little risk, but large benefits to local authorities in saved officer resources which could usefully be deployed elsewhere. If the reporting requirements were removed, there is potential that some local authorities may cease to carry out important monitoring.

Recommendations

- 5.2 A number of recommendations are presented in the Summary Conclusions at the end of the report sections for each of the Work Packages. It is suggested that key members of Defra hold internal discussions to decide which of the recommendations and changes they would wish to implement. Consultation with representatives from DfT and DECC would also be required, to decide the ownership of some aspects of the changes.
- 5.3 These internal discussions would allow the construction of a draft “change plan” for the Action Planning process. Some actions proposed in this report could be implemented quickly, others will need considerably more time and planning. Consequently careful project management would be required to propose an efficient plan that is scheduled/phased in the most sensible way. Once a draft plan is available, it will be sensible to liaise with local authority representatives and other key stakeholders.

- 5.4 Whether some significant changes to the action planning process are included in the report or not, a substantial amount of time will need to be invested in improving the current guidance material. So it will be sensible to compile a list of guidance documentation that will be produced.

6 Appendices

A1	Local Authorities Selected for Case Study Review.....	43
A2	On-line Survey Responses	45
A3	Assessment of USA and Progress Reports.....	58

A1 Local Authorities Selected for Case Study Review

Table A1.1: Local authorities selected for Case Study review and justification

Local Authority	Justification
London Borough of Hillingdon	The AQAP has been successfully implemented for the majority of measures. Greater success has been achieved where LBH has had full control of implementation. The measures have been quantified in terms of their effectiveness (e.g. a modal shift for school travel plans, and measured reductions in traffic on roads) but not in terms of emissions or concentrations reduction.
Stockport MBC	Good example of regional cooperation between local authorities and implementation of measures via the LTP.
Sheffield CC	The AQAP has been successfully implemented for the majority of measures, but no quantification (in terms of emissions or concentrations) was provided, despite the availability of a city-wide emissions inventory and model.
Oxford CC	Council indicate they will reach agreement on LEZ by end of 2011 and is the basis for a good case study on how this process was achieved.
Nottingham CC	Council has used new initiatives, and there has been successful integration into LTP.
Norwich CC	The Council has successfully implemented a LEZ and used EU funding to support this work
Newcastle CC	Even though concentrations not improving, a lot has been implemented, largely through LTP process, but also working with external bodies such as bus operators etc.
York CC	Council has achieved full utilisation of both transport and planning systems to implement measures. Particularly good use of LDF process.
Perth and Kinross	Council has been quite successful in implementing measures in relatively short period of time.
Bristol CC	Bristol CC has implemented a range of measures, some of which are proving to be effective in terms of improving traffic flows and reducing vehicle kilometres.
LB Camden	The measures chosen have been quantified in many cases and good progress is being made in implementation.
Cardiff CC	The creation of the PFE at St Mary's appears to have been beneficial and is an option to be further explored.
LB Croydon	The majority of measures have been implemented. However, the effectiveness of the measures is unknown.

Gravesham BC	The authority is pro-active and has recently drawn up a third action plan, which refines previous actions where necessary and introduces new ones.
Lewes DC	The Council are well engaged with the Action Planning process.
Exeter CC	Some progress made, but major progress limited by delay of Major Scheme Bids. Exeter University study of impact of measures likely to be useful
Rushcliffe BC	The Council relies heavily on the County to implement measures via the LTP2, which is appropriate. There is excellent reporting of progress within the PR, and the Council maintains a very proactive approach
Newport CC	A reduction in NO ₂ concentrations alongside the M4 motorway appears to have been achieved, but no recent update on progress with other measures has been provided. A revised AQAP is scheduled to be produced during 2012. The revised action plan will also include a detailed update on progress made with implementing the measures included in the first action plan.
RB Windsor & Maidenhead	Good example of implementation of the action plan through the LTP
City of London	Many of the AQAP measures have been implemented and the authority is taking a very pro-active approach.

A2 On-line Survey Responses

A2.1 The following provides a summary of the responses from the on-line survey circulated to representatives from the local authorities selected for the Case Studies. For most questions, there were 15 responses. The responses are those of individuals, and do not necessarily represent the views of the relevant local authority.

A2.2 The following two quotes provide a useful insight into the responses overall:

"It is not reasonable to expect a LA with the limited resources available to be able to reduce car travel by 15% within an AQMA through engagement. It requires bold infrastructure improvements, strong political will and total buy in from all stakeholders."

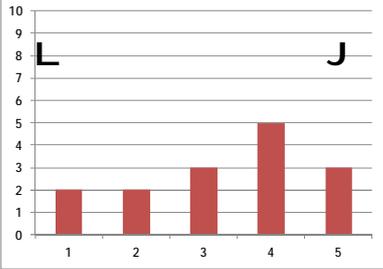
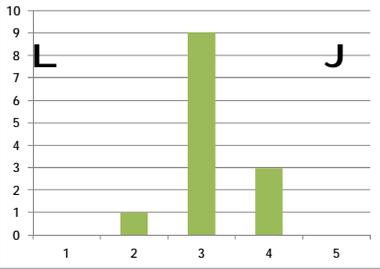
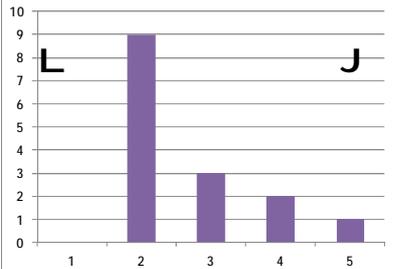
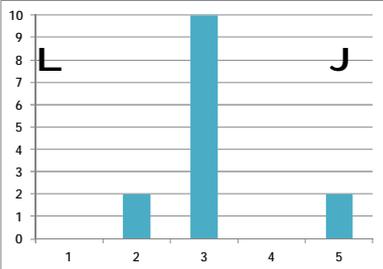
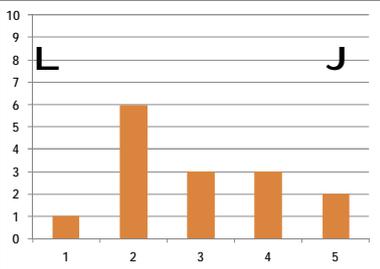
"We are experiencing considerable problems trying to raise the profile of AQ. The main impetus by the council is for regeneration and air quality issues are not being addressed."

1. Selecting Measures

Q1: How did you go about selecting the measures to include in your AQAP?

Numerous responses suggested that “all” potential measures were considered at the outset. Consultation with stakeholders and more detailed consideration then allowed a short-list to be determined.

- It was noted that by considering “everything” at the outset (as per Defra Guidance 2004) the result is often an AQAP that is too generalised/includes too many actions.
- Good links with transport authorities, and LTP were evident.
- Replies indicated a varying extent of forming inter-departmental groups, consulting key stakeholders, use of public consultation, consultants etc. and a similarly varied level of detail in assessing potential measures.

How easy was it to decide which measures to include in your AQAP?	Was there enough guidance to help with this process?	Enough access to info on the likely effectiveness of different measures?																																				
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Were the case studies and examples of best practice provided on the LAQM website helpful?	If no AQAP, what proportion of your measures would have been implemented anyway?																																					
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Q2: What sources of information did you use to plan your measures?

The top four sources mentioned in responses were:

- Defra Guidance, LTP, Consultants (including modelling) and Case studies/good practice.

Whilst not explicitly mentioned in all responses, in-house expertise was clearly considered important. Other sources included: Consultation, LAQM Helpdesk, DfT website and the HA, NSCA Guidance, EPUK UK Guidance, London Mayor's AQ strategy.

Q3: Were there useful datasets which were not available?

Traffic Data was the main response.

It was also noted that there is no support/tools etc. for quantifying costs and impacts of measures.

Other replies included: Some data were provided by our consultants, some data were created specifically for our AQAP, Euro standards for specific vehicles.

Q4: What changes could be made to the provision of case studies and best practice guidance that would help in preparing an AQAP?

"The information out there about preparing an AQAP is quite good. The implementation of the plans and the tracking of real improvement remains the challenge."

The top four answers were:

- They are fine as they are
- We didn't use them
- More on the quantification of emissions
- Monitoring mechanisms that continually assess effectiveness/progress of an action

Other replies included: Studies that have actually worked for NO_x, Apportionment of the impact on emissions, List of data required to support each measure, A list of core measures/template approach, Keep examples more current, Greater variety, Keep in a single document.

Q5: Were there measures that you did not include in your AQAP because you considered them to be too difficult to implement? If so, please describe which measures.

The following reasons were all given for not including measures in the AQAP:

- Politically unacceptable (and in particular concerns over economic displacement)
- Lack of funding
- Publically unacceptable
- Implementation falls outside remit
- Not considered practical or cost effective.

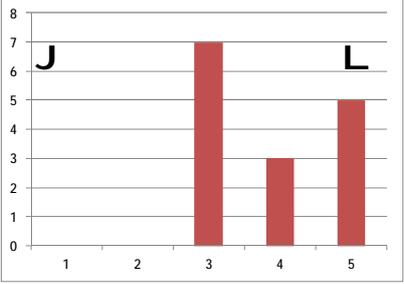
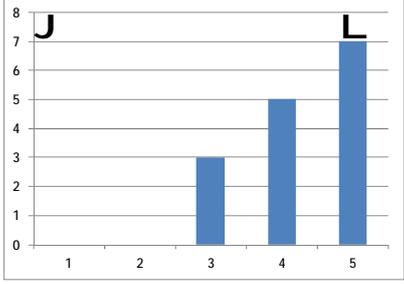
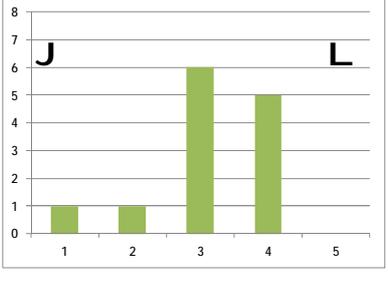
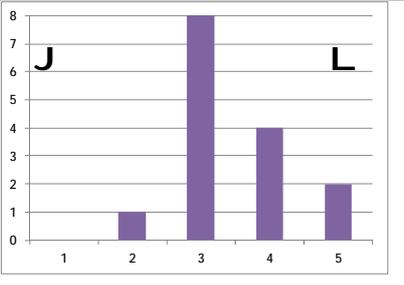
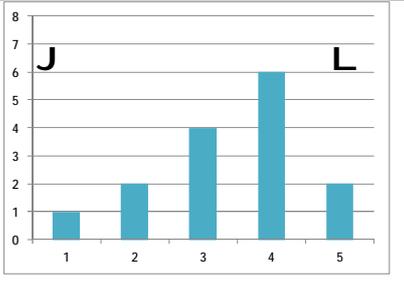
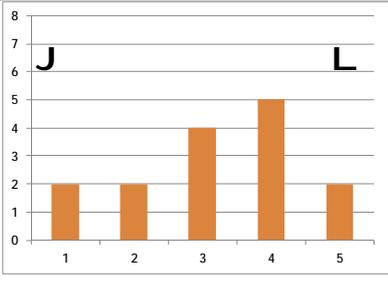
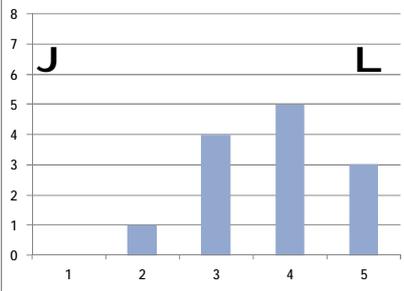
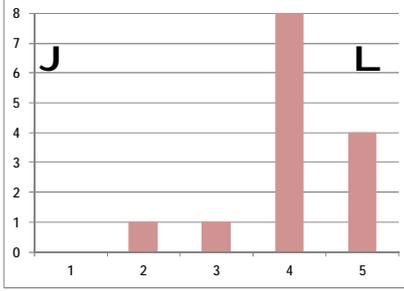
The following were given as specific examples of the above: LEZs, Congestion charging, Park and Ride, major changes to the road layout/infrastructure and Emissions from taxis.

Q6: Any further comments on selecting measures?

- The more ambitious measures do not usually get approval due to political/commercial concerns (particularly regional scale). The result is an AQAP that lacks teeth.
- It is important to recognise that regional scale measures are needed, and that transport and planning are heavily involved in the process.
- LTP3 offers more focus on low emissions transport, but does not provide enough funding for the required measures (tackling HGV's, promoting lower emission vehicles etc.).
- Lack of progress on NOx has been due to actions at the national level.

2. Implementation of Measures

Q7: Please indicate the extent to which the following have been barriers to implementing the measures in your AQAP:

<p>Limited man time</p> 	<p>A lack of sufficient funding</p> 	<p>Legal obstacles</p> 
<p>Organisational challenges</p> 	<p>A lack of political will/support</p> 	<p>Complex technical issues</p> 
<p>Practicalities of implementation</p> 	<p>Concern over displacing economic activity</p> 	

Q8: Please feel free to add any explanatory/additional text on your selections above.

There are a lot of activities associated with traffic planning at the larger scale. But trying to focus efforts to AQMA has proved very difficult.

Economic development/regeneration always comes before air quality considerations.

Q9: We have noticed that very few AQAPs or Progress Reports include any quantification of their impacts (in terms of either emissions or concentrations). What have been the main barriers to including some quantification in your AQAP and PR?

Most replies explain that there are limitations in terms of cost and man power to undertake detailed modelling work. There is often reliance on “partners” to undertake the work.

Other comments include:

- Monitoring effectiveness has not been built sufficiently into the transport management or the planning process.
- Difficult to obtain detail about the current and projected vehicles on the road (needs ANPR), and uncertainty regarding the reliability of current NOx emission estimates.
- Little impact is evident from the NOx monitoring.

Q10: What would help in supporting you to quantify impacts?

- Many responses refer to limited resources.
- Improve the input data – NAEI NOx emission estimates, information on Euro standards in vehicle fleets etc. to improve the quantification of impact of e.g. LEZs
- More effective monitoring of impacts is called for.
- A tool for LA's to model impacts of measures– because there isn't the funding to employ consultants.
- Fund public transport demand studies.

Q11: It appears that in a number of locations, numerous measures have been successfully implemented, but have not resulted in significant reductions of measured NO₂ concentrations. If this is the case for your area, what is your understanding of why this has arisen? For example, is it due to AQAP measures not delivering as expected? Have national scale issues had a significant impact? etc.

The “diesel and NO_x issue” is cited in most replies. (both in terms of unrealistic emission factors, and the higher use of diesel than forecast.

Successes are generally confined to locations where measures have delivered a substantial reduction in traffic volumes.

Q12: If measures did not delivery as expected, to what extent were factors beyond your control?

An average of 1.6 (where 1=no control, 5=fully within control)

Q13: Are there practical changes to the manner in which local AQAPs are prepared and implemented that would help to address any issues associated with scope of control?

The main consensus is that: Changes to the manner in which AQAP's are prepared and implemented are tinkering at the edges and won't solve the air quality problem.

Three possible solutions proposed:

- Provide LAs with more powers to implement changes.
- Some aspects of the AQAPs, or legal requirements, should fall on partners. Examples include local transport planners, the highways agency, DfT.
- National policy required; for example national policy on Low Emission Zones.

Q14: Some authorities work with each other to deliver action plans. What has been your experience? Do you think it helps with AQAP planning and delivery? Are there other delivery partners that you consider important? Where do you think that you have had particular success?

There are some good examples of regional co-ordination and collaboration with a wide range of stakeholders. However it is recognised that this slows the decision making process and implementing actions.

In addition difficulties associated with the road sector is recognised:

- “The Highways Agency is obviously a key partner and one which we have struggled to influence.”
- Positive changes in regional transport policy are blocked at a political level, so we are unable “to move forward.”

3. Measuring Success, and Improving the System

Q16: What have been the most important factors in ensuring that your measures have delivered successfully? (use "NA" if you feel that you are not well placed to comment):

Not important, Quite important, Important, Very important, NA

Well resourced (in terms of man time)	Very Important (strong)
Well funded	Very Important (unanimous)
Strong technical team	Very Important (strong)
Measures kept simple	Important (spread)
A sensible level of ambition	Important (spread)
Good co-ordination & support across departments	Very Important (strong)
Regional co-ordination across neighbouring LAs	Quite Important (spread)
Political will to deliver	Very Important (strong)

Other: Support from external partners and good communications and indicated as important.

Q17: How have you captured the range of benefits that action planning may have had on other aspects?

Several examples of inclusion in the initial planning/assessment stage of the measures in the AQAP, which included cross-department working.

Q18: Would any of the measures in your action plan have been taken forward for reasons other than air quality?

The majority of responses indicate that most/all road measures would have been implemented without the AQAP. However in some cases the AQAP may have accelerated the measures.

It is suggested that the work done to date has allowed AQ to be kept on the agenda, and that future measures which specifically deliver AQ improvements will have only been possible because of this.

Q19: Do you have measures within your AQAP that could be used as case studies, or examples of best practice?

Some references provided.

Q20: Currently, the success of the AQAP is judged against achieving compliance with the objectives, or in reducing pollutant concentrations. It is possible to use other metrics... Q21: What are your views/thoughts on the pros and cons of such an approach based on a) emissions or b) other indicators linked to action plan implementation?

Emissions Metric

Replies indicate support for using an emissions metric to assess impacts, and there is a recognition that this would be better to present to transport planners, and demonstrate the impacts of modal shift. It also makes e.g. development led emissions 'creep' more tangible.

There is also a strong message that an emissions metric would allow more of a celebration of success, as opposed to quoting almost insignificant changes to concentrations. It is noted that this has a real impact on interaction with the public.

However there is a recognition that gathering "real" data is important, and that using an emissions metric would potentially require local authorities to undertake more work.

There is a clear lack of confidence in current emissions datasets/emission factors.

Other Indicators

There are mixed replies regarding this. Whilst it is suggested that alternative metrics have real value, they can often be time consuming to compile. Some suggest that these metrics should be included as part of the AQAP process.

However, the question is raised as to the purpose of AQAPs and their measures:

- Some suggest that measures should not have a focus on compliance with objectives. This is because it can be difficult to determine for each measure, and there may be external factors that affect the delivery or resulting impact.
- Others point out that the purpose is ultimately to achieve health based metrics and therefore are very focused on compliance and require demonstration of this from concentration measurement.

Q22: If you had an open remit, what changes to the current AQAP process do you think would be most helpful (please indicate up to four, starting with the most important)?

"I think the LAQM process is broken. We haven't delivered compliance after ~15 years. It's time to rethink the whole approach."

"I do not find the report requirements overburden some however I do feel local government should have a stronger remit to drive the actions forward."

Stronger LA Remit

- Stronger remit on local government to comply would be useful BUT it must be equitable, if sources are outside of direct control will cause a stalemate with everyone blaming each other and nothing will proceed.

Getting Tough

- There is a call for legislation that has more teeth and provides penalties to underperforming LA's (or road authorities).
- Verification of measures and their impacts with penalties for consecutive failures would provide more impetus for change.

National Government

- More help from central government generally with accelerating the uptake of low emission vehicles is called for. This would help LAs to better understand emissions from the vehicles on their roads...
- Raised profile of air quality - greater publicity and emphasis on this issue

Streamlining

- One annual report
- Streamlining is helpful, but there are concerns that this drives a reduction in staff numbers.

Regional

- Stronger remit on regional authorities to work with local govt and actually fix the problem;
- Stronger guidance to the other main players ie planners and transport, to monitor effectiveness of the actions they take;

Roads/Highways

- Move responsibility to the Highways Authority where appropriate.
- Stronger requirement for transport authorities to implement infrastructure change based solely on air quality evidence. In addition this must be appropriately funded.
- Grant monies are key to delivering on the ground measures but to have a real impact these funds are not enough and transport authorities would benefit from monies that themselves are ring fenced for infrastructure improvement that is driven by air quality improvement needs alone.

- Why does DfT not take more of an active role/ responsibility? Local transport authorities would likely take more notice of DfT than they would DEFRA in terms of delivering AQAP and it would make the delivery of an AQAP more equitable.

More involvement from central Government

- More Central government pressure on LA's at corporate level, and the reaffirmation of importance by Government.
- A clearer link to health impacts, the costs of poor AQ and the benefits of improvements.

More staff/resources

- More time and resources available to undertake further assessments, source apportionment, impact assessment for specific measures and monitoring of impacts to ensure the measures put in place are the right ones to tackle the problem.
- To have less reliance on LTPs as the main source of funding for air quality improvement so that emission improvement only schemes can compete for funding more effectively against wider modal shift and congestion reduction schemes.

Guidance

- To assist this better guidance is needed on how to monitor the impacts and what data is needed.

Focus

"I think the single most effective thing would be to change the remit of AQMAs and make them mean something like a Smoke Control Area."

Q23: Do you think that the involvement of National Government is at the right level?

There is scope for the National Government to contribute more support **50%**

National level Government should be considerably more involved... **40%**

Q24: Please feel free to add general comments on any aspect of AQAPs that you think have not been addressed. Are there questions that we should have asked?

Government must do more to ensure that LAs are properly investigating AQ in their area not merely checking the report submitted.

“The introduction of the new CILS has severely hampered our ability to obtain funds for implementing action plans and at the moment there is no senior officer will to allow us to produce a Section 106 obligations SPG.”

A3 Assessment of USA and Progress Reports

LA	Reports Reviewed	Outcome of USA and PR	Highest NO ₂ concentration	Comments
Richmondshire DC	2011 PR	First Stage 1 Report Completed in 1999. Council completed DA in 2003 for SO ₂ emissions from domestic fuel combustion (no AQMA needed). 2007 – 2010 USA/PR considered potential for new exceedences associated with A66 and A1 upgrade.	28.7 µg/m ³	Nitrogen dioxide monitoring with diffusion tubes maintained (4 sites). Only main pollution sources are A1 and A66
Rutland CC	2009 USA	No exceedences identified in 2006 USA. Oakham Bypass has reduced NO ₂ concentrations in Oakham.	33.9 µg/m ³ (2008)	Rural authority. Only pollution sources are A1 and other trunk roads. Council maintains a network of 9 diffusion tube sites.
Stafford BC	2010 PR	First Stage 1 Report Completed in 2000. Measured exceedences of NO ₂ objective at kerbside site in Stafford in 2008 and 2009, and at M6 kerb but no relevant exposure.	32 µg/m ³	Largely rural authority with M6 motorway and A34, A500 and A50. No relevant exposure at locations of current exceedences, but new development could take place in the future. Council maintains a large network of diffusion tube sites (36).
Stevenage BC	2011 PR	First Stage 1 Report Completed in 2001. 2006 USA identified need for a DA at A602 Hitchin Road, but concluded no need for AQMA. 2008 PR identified measured NO ₂ concentrations close to the objective in this area. 2010 monitoring still indicates an exceedence but no relevant exposure.	32.1 µg/m ³ (2010) at relevant location.	Stevenage is a moderate size town with population c. 80,000. Council maintains an automatic site (NO ₂ and PM ₁₀) and a large network (19 sites) of diffusion tubes.
North Norfolk DC	2009 USA	First Stage 1 Report Completed in 2001. 2003 USA identified a potential NO ₂ hotspot in Hoveton, but subsequent monitoring has shown the objective is not exceeded.	35.8 µg/m ³ (2008)	Largely rural authority, with a number of main market towns. Council maintains an automatic monitoring station (NO ₂ , SO ₂ and PM ₁₀) and a network of 14 diffusion tubes. USA notes that a new proposed development includes a biomass plant, and there are proposals to develop the harbour at Great Yarmouth. R&A seen as

				beneficial to assess the potential impacts of these developments.
Mole Valley DC	2011 PR	First Stage 1 Report Completed in 2001. Authority has operated a network of diffusion tube sites since 2000. Concentrations on West St (narrow street canyon) have approached the objective ($39 \mu\text{g}/\text{m}^3$), and at M25 SCC depot (no relevant exposure) have marginally exceeded the objective.	$39 \mu\text{g}/\text{m}^3$ (2006)	Although levels at the M25 site do not represent relevant exposure, the Council intends to undertake a more detailed investigation with a continuous monitor at a nearby site. Council maintains one automatic (NO ₂) site and 15 diffusion tube sites.
Christchurch BC	2009 USA; 2011 PR	First round of review and assessment completed 1999. Up until the 2009 USA, the Council had concluded that there would be no exceedences of the objectives. The 2009 USA identified the need for a DA associated with narrow, congested streets in two locations. Monitoring is being carried out Jan-Dec 2011.	$38.1 \mu\text{g}/\text{m}^3$ (in 2010, increased from $29.0 \mu\text{g}/\text{m}^3$ in 2008)	Small, largely rural area, encompassing the town of Christchurch. Council maintains a network of 21 NO ₂ diffusion tubes.
Tandridge DC	2010 PR; 2011 PR	First round of review and assessment completed in 1998 (9 subsequent reports completed to date). NO ₂ diffusion tube monitoring across a network of sites in main towns and villages. Concentrations substantially higher at all sites in 2010 than in 2008/2009. Level exceed the objective at 3 locations (2 of which non-relevant); one in Nutfield ($42 \mu\text{g}/\text{m}^3$) appears to be at relevant location	$42 \mu\text{g}/\text{m}^3$ (in 2010)	Largely rural area with no large towns. M25 and M23 motorways cut through area, together with A22 and A25. Council maintains a network of 26 diffusion tubes. NO ₂ concentrations substantially higher in 2010 than in previous years. LA appears to have taken no action with regard to the measured exceedence in Nutfield which is stated to be at site of relevant exposure (although at the kerbside).
Craven DC	2010 PR; 2011 PR	First round of review and assessment completed 1999. (9 subsequent reports submitted to date). 2009 USA recorded a measured concentration of $41 \mu\text{g}/\text{m}^3$ at a location in Long Preston; decision taken to continue to monitor rather than proceed to a DA. 2010 annual mean concentration only $20 \mu\text{g}/\text{m}^3$.	$30 \mu\text{g}/\text{m}^3$ (in 2010)	Largely rural area encompassing the Yorkshire Dales National park. Key trunk routes include the A65 and A59. Council maintains a network of 11 diffusion tubes.

Harlow DC	2010 PR; 2011 PR	Information of reporting since 2004 provided. 7 subsequent reports completed. Measured concentrations all below the objective in 2008-2010.	33.7 $\mu\text{g}/\text{m}^3$ (in 2010)	Largely rural area with no large towns. M11 motorway and A414 cut through area. Council maintains a network of 4 diffusion tubes.
West Somerset Council	2009 USA; 2011 PR	Information of reporting since 2003 provided. 9 subsequent reports completed. Measured levels higher in 2010 than in 2008-2009.	39.2 $\mu\text{g}/\text{m}^3$ (in 2010)	Largely rural area encompassing Exmoor National Park, with no large towns. A39 and A358 links main settlement areas along the coast. Council maintains a network of 6 diffusion tubes. Hinckley Point C a large proposed development (ES reviewed in 2011 PR).
Wealden District Council	2001 PR	Information on previous reporting limited, but stated there has never been a requirement to proceed to a DA or declare an AQMA. Historical nitrogen dioxide monitoring data have not been reported due to previous QA/QC issues with the data, and results thought to be unreliable.	31.5 $\mu\text{g}/\text{m}^3$ (in 2010) adjusted from a roadside value of 44.4 $\mu\text{g}/\text{m}^3$	Largely rural area with major roads A22, A26. Higher NO ₂ concentrations measured close to these roads, but no relevant exposure. Council maintains a network of 4 diffusion tube sites (E Sussex CC also maintains 6 sites in the DC area).
High Peak DC	2011 PR	First round of review and assessment completed 2000. A total of 10 reports have been subsequently prepared. All previous reviews and assessments had shown no exceedences of the objectives; however as part of an EIA for a new bypass, the developer set out a large number of diffusion tube samplers and identified exceedences at a number of kerbside sites – the authority has decided to proceed to a DA	Highest concentration in 2010 was 34 $\mu\text{g}/\text{m}^3$ (adjusted to relevant location);	Largely rural area with main towns of Buxton and Glossop. Area crossed by number of main roads including A6, A628 and A57. Council maintains an automatic site (NO ₂ – established 2011) and a network of 13 diffusion tubes.
Allerdale BC	2009 USA	First stage of review and assessment completed in 1999. Outcome has been that none of the objectives are likely to be exceeded.	Highest concentration over past 3 years has been 29.5 $\mu\text{g}/\text{m}^3$	Largely rural area encompassing lake District National park. Council maintains a network of 6 diffusion tube sites.

Fermanagh DC	2011 PR	First stage of review and assessment concluded there would be no exceedences of the objectives. A further 6 reports have subsequently been submitted. Currently no monitoring carried out by the local authority.	Highest concentration 26.9 $\mu\text{g}/\text{m}^3$ in 2006.	There has been no monitoring carried out by the Council since 2006.
Torfaen BC	2011 PR	First stage of review and assessment completed in 2000, and concluded that none of the objectives would be exceeded. A total of 8 subsequent reports have been produced.	Highest (roadside) concentration 35.3 $\mu\text{g}/\text{m}^3$ in 2008	Council maintains a network of 13 diffusion tube sites.
Gwynedd Council	2010 PR	First stage of review and assessment completed in 1999, and concluded that none of the objectives would be exceeded. A total of 9 subsequent reports have been produced. PM_{10} monitoring has been conducted at industrial locations, and SO_2 monitoring has indicated a potential exceedence associated with steam locomotive emissions.	Highest (kerbside) concentration 47.2 $\mu\text{g}/\text{m}^3$ in 2008 (adjusted to 26.3 $\mu\text{g}/\text{m}^3$ at closest receptor)	Largely rural area with main areas of population at Bangor and Caernarfon. Some major roads (A55, A470). Council maintains a network of about 30 diffusion tube sites.
North Ayrshire	2011 PR	First stage of review and assessment completed in 2000 and concluded no exceedences of the objectives, but recommended a programme of NO_2 monitoring. A total of 9 subsequent reports have been produced. Monitoring in 2010 identified a very localised hotspot on High St, Irvine where NO_2 levels exceed the objective, and a DA is being undertaken.	41-50 $\mu\text{g}/\text{m}^3$ in 2010	Largely rural area. Principal pollution sources are road traffic from major trunk roads (A78, A737) and congested traffic in towns (Irvine and Dalry). Council maintains an automatic site (NO_2 and PM_{10}) and a network of 37 diffusion tube sites.