

Marlow Low Emission Zone

Feasibility Study
Proposal

Buckinghamshire Council

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1. Introduction

Buckinghamshire Council is looking for quotes to conduct a low emission zone (LEZ) feasibility study for Marlow town centre. We note that the term Clean Air Zone (CAZ) is a comparable term to LEZ used to describe an area where charging is used to encourage the use of cleaner vehicles. Many UK authorities have been mandated by the Government to introduce a CAZ and there is a national and consistent framework set up for these schemes. We would propose to follow this existing framework when assessing charging options for Marlow.

The main objectives for this study are:

- To identify a range of measures, including charging options, which could be adopted to reduce air pollution in Marlow.
- To qualitatively assess these measures based on likely effectiveness, cost, practicality, risk, etc. This would need to include consideration of enforcement of the measures, where appropriate.
- To quantify the effectiveness of preferred options, chosen in agreement with the Council, using dispersion modelling. A possible set of scenarios may include:
 - Non-charging option model runs;
 - Charging option; and
 - A package of the charging option with one or more non-charging measures.
- To form a conclusion about the feasibility of introducing a LEZ and/or other measures in Marlow, how it would need to be done, how effective it would be, and how much it would cost.

An air quality management area (AQMA) was declared in Marlow town centre in 2017 due to exceedances of the annual mean objective for nitrogen dioxide (NO₂). The AQMA boundary incorporates the main vehicle routes into Marlow from the A404, including the High Street and A4155. Measured concentrations of NO₂ indicate that whilst long-term trends are broadly improving slowly, levels remain above the objective and the maximum recorded exceedance in 2019 was 43.7 µg/m³ at monitoring site S21 on the A4155. The primary source of NO_x emissions is due to vehicle exhaust, and the town can become heavily congested during peak hours as well as at weekends, with many visitors driving into Marlow for days out.

We have set out below our proposed tasks to deliver this study. A staged process of work will be conducted, with regular communication between AECOM and the Council, starting with a project kick off meeting, to ensure that the project's objectives are met.

2. Proposed Scope of Work

2.1 Stage 1 Identify Baseline Conditions

2.1.1 Review of Air Quality Data

AECOM will collate and review monitoring (and modelling) data provided by Buckinghamshire Council in, and near, the Marlow AQMA to identify areas where concentrations currently exceed (or are close to exceeding) objectives. Historical measurements will be reviewed, any apparent trends identified, and areas with the highest concentrations will be identified as potential areas for priority action.

The Defra national Pollution Climate Mapping (PCM) model has identified roads throughout the UK where exceedances of the annual mean NO₂ objective are predicted to occur, although we recognise that particulate matter (PM₁₀ and PM_{2.5}) and carbon emissions will also be concerns for this project. The PCM predictions on roads in and around the study area will be reviewed as part of the baseline review.

2.1.2 Review of Key Documents

AECOM will conduct a review of the measures that have been implemented (or part-implemented) through policies, plans and interventions to date such as the existing AQAP. The success of each measure will be reviewed in terms of its uptake and its actual, expected or likely effect on emissions.

We will consider the Council's strategic plans for various disciplines including air quality, planning transport, industry and energy, as the holistic effects from these documents may be most appropriate to support the objectives and opportunities the Council can enable. This stage will require support from the client to ensure the key documents are identified and provided for review.

2.1.3 Automatic Number Plate Recognition (ANPR) Survey

An ANPR camera survey is proposed to be undertaken to inform the composition of the local vehicle fleet and to create an accurate emissions profile based on vehicle classifications and ages.

It is proposed to use a third-party supplier to conduct a 24-hour ANPR survey on a neutral weekday and weekend day to record vehicle number plates. For the core price, a single camera site in the centre of Marlow will be set up for both days to monitor vehicles travelling in both directions only. Additional cameras can be sited at an additional cost, but it is expected that to obtain a representative fleet mix, a single site should provide a good level of accuracy required for this study.

The vehicle registration data will be processed through the DVLA and open source data processing software 'R' to determine information on the vehicle fleet composition (vehicle type, age, fuel type and Euro Class). Information by time of day for a weekday and weekend can be gathered and this local fleet breakdown can be compared with the default breakdown given by DfT for urban areas to determine if there are any key differences. AECOM has worked with suppliers to conduct similar ANPR surveys for many local authorities to complete their NO₂ Local Plans for the Joint Air Quality Unit (JAQU), including for second and third wave local authorities; Tyneside Councils, Portsmouth, Liverpool and Leicester.

2.1.4 Emissions Modelling

The County transport model will be used to determine the traffic flows, classifications and speeds on major road links in the district for an existing baseline (e.g. 2019) and future implementation baseline (e.g. 2023). If the County model cannot be used for any reason then we will discuss this with the client and advise on potential alternative sources of information, such as DfT traffic count data, which may not be ideal but sufficient for the purposes of this study.

The local adjusted fleet profile from the ANPR camera survey will be used in conjunction with the Emissions Factor Toolkit (EFT) v10.1 to calculate the total emissions on road links in the study area, and which will inform both the scenario testing and detailed dispersion modelling, as outlined below.

AECOM has prepared an internal position statement and review of fleet projections, and we are working with clients on their Clean Air Plans for JAQU with regard to the ongoing pandemic event and the likely impacts on fleet turnover and traffic volumes. Therefore, we will advise on appropriate projected fleet scenarios that may be used for the core scenario or for sensitivity testing if required.

2.1.5 Source Apportionment

Further analysis through the EFT will be conducted using the local fleet obtained from the ANPR surveys to determine the main vehicle contributors to NO_x emissions across the weekday and weekend periods. It is expected that the detailed ANPR fleet data would improve the confidence in this source apportionment exercises and would specifically inform scenario testing by targeting the most significant emission sources and to inform the level of reduction that may be achieved. AECOM will prepare summary tables or maps in GIS as appropriate to show the contribution by vehicle type.

2.1.6 Baseline Detailed Dispersion Modelling

The ADMS-Roads 5 detailed dispersion model will be used to predict the annual mean concentration of NO₂, PM₁₀ and PM_{2.5} at locations of relevant exposure for the validation baseline (e.g. 2019) and the projected future baseline (e.g. 2023).

Where appropriate, the model will include consideration for street canyoning and gradients, as well as areas of congestion or queuing. The dispersion modelling outputs will be verified against the available monitoring data, assumed to be provided by the Council, in accordance with guidance in LAQM Technical Guidance '16 (LAQM.TG(16)). This will improve the confidence and bias factors associated with modelled outputs, increasing confidence in modelled results and any conclusions as a result. These data will be used to determine the locations of exceedance of the air quality objectives but will also be correlated with the socio-demographic scoring to indicate the priority areas for improvements to health (see below). The resolution of the index of multiple deprivation (IMD) is at ward-level, and so will be interpreted proportionally to inform the range of socio-economic disparity in the population that may be affected by proposed measures.

2.2 Stage 2 Identify Air Quality Interventions

2.2.1 Interventions Review

We will review the best-practice for local and national, policy and guidance interventions, including an outline of the potential costs or benefits to inform this study. AECOM have undertaken a number of strategic action plans, and so we have a library of measures and experience to identify the most effective options that may be appropriate.

We have significant experience undertaking feasibility and implementation studies for CAZs at various scales, as well as AQAPs for LAQM reporting. We anticipate that a CAZ may be highly effective on the affected roads, but it is a 'sledgehammer' type measure that could have significant detriments for other factors and is generally less effective for PM10/PM2.5 due to the contribution from non-exhaust emissions. Therefore, we expect that a final preferred package would be most effective by incorporating measures based around local and strategic interventions, depending on the level of political commitment and technical 'buy-in' from other departments and stakeholders.

We will conduct a qualitative study to determine viable, effective and quantifiable measures that could be implemented, based on existing monitoring and modelling data, Defra's predicted rate of improvements and traffic information gathered on the traffic characteristics. We will also use other available evidence on the potential impacts (e.g. emissions reductions) of potential measures and use our professional experience gained from working with other authorities, including for the local authority NO₂ Local Plans, AQAPs under the Local Air Quality Management (LAQM) regime (for cities such as Durham and Manchester), developing low emission strategies (e.g. for Exeter, Sefton and various West Midlands Authorities) and traffic mitigation measures (for Guildford).

The client buy-in and engagement is essential as the project is developed collaboratively, so we can ensure local priorities and concerns are built-in to reviews and deliverable outcomes prior to the later consultation workshops. This will ensure ownership of the project is maintained at every stage.

We will also review the potential effects of the pandemic event, which may alter the annual fleet turnover, as well as behavioural response to promoting and increasing adoption of public transport or active, and specifically electric micro-mobility such as e-bikes and e-scooters.

LAQM.TG(16) also provides a long list of measures within Annex A: LAQM Action Toolbox which can also be consulted for potentially viable measures.

2.2.2 Technical Consultation Workshop

We will put together a list of potential measures to be discussed at a workshop with key stakeholders where we will conduct a qualitative review to creating a preliminary ranking of the measures on aspects such as their relative impacts (on air quality and other wider environmental issues), how quantifiable the measures are, deliverability, likelihood of success, risks, timescales of introduction and potential costs.

The workshop and any team discussions would be held remotely using Teams conference call. It is important that attendees are wholly engaged with the process, so smaller discussion groups of 4-5 people may be more effective depending on how many stakeholders are invited. The outcome of the workshop will be to inform the final list and prioritisation of measures in Stage 3 (below) so they are targeted to those that bring about air quality improvements in the shortest possible time whilst not adversely affecting areas elsewhere within the borough.

Depending on the main sources and journey purposes, measures may include;

- traffic management measures (e.g. speed enforcement);
- promotion of public transport (such as park and ride or bus subsidies);
- freight consolidation centres or incentives to use non-private car modes for major workplaces as well as charging options.

We will also review potential complementary measures, such as the use of green infrastructure (GI) to disrupt the exposure pathway and achieve holistic co-benefits, such as improved surface drainage, greater biodiversity and support for place-making aspirations.

2.3 Stage 3 Appraisal of Actions

2.3.1 Actions Prioritisation and Ranking

Interventions refined in the previous review (Stage 1) and consultation (Stage 2) stages will be attributed a bespoke score based on sub-criteria, along with a weighting strategy that incorporates factors such as local priorities, or timescales to ensure that sub-criteria of greater concern or impact are appraised for a higher risk/opportunity.

Themes or actions that will not be acceptable at this stage for any reason will be clearly identified in discussion with the client in order to focus further efforts efficiently and avoid wasting time.

The ranked results will be shared by email with the technical workshop group in Stage 2. The outcome of this task will be to identify a package of measures or a preferred measure to take forward for further consideration and quantification.

Table 1: Example of Appraisal Scoring Criteria

Score	Local Air Quality		Climate Change (GHG)	Implementation & Enforcement				
	Extent	Magnitude	Magnitude	Timescale of Effect	Cost & Feasibility	Inclusion & Accessibility	Economy	
High	3	Large area, including key priority areas	Large, quantifiable change	Large, quantifiable change	Immediate <12 months	No cost	Major Beneficial	Major Beneficial
Medium	2	Discrete areas, including key priority areas	Moderate, certain to achieve some quantifiable change	Moderate, certain to achieve some quantifiable change	Short / Medium < 3 years	Direct minor cost	Minor Beneficial	Minor Beneficial
Low	1	Discrete areas, but not necessarily a key priority area	Minor, subjectively likely to lead to a change, but may not be easily quantified	Minor, subjectively likely to lead to a change, but may not be easily quantified	Long > 3 years	Direct major cost	Neutral or Detrimental	Neutral or Detrimental

2.3.2 Actions Short List

The following work is intended to refine the long-list and themes into a short list of viable measure and interventions.

The viable measures identified in the review stages will be summarised and ranked to determine those that may be most effective in a local context, with regard to the Councils' aspirations to achieve compliance with national air quality objectives, but also to achieve tangible health benefits that would specifically recognise social disparity. It is essential the short-listed measures would also complement existing programmes that may be proposed or have secured approval and funding, highlighting co-benefits, risks and opportunities to achieve the best possible overall outcome. The preferred options will be further reviewed to indicate the potential effects in terms of emissions, as well as timescales for their delivery.

2.3.2.1 Socio-economic Review

We recognise that the tangible effects of air quality interventions have traditionally been difficult to quantify. Therefore, we will use a holistic approach that tracks the overall benefits in terms of multiple indicators for public health and social inequality. We will do this using existing tools and data sets, such as Indices of Multiple Deprivation for Lower Super Output Areas, and tools published by Public Health England.

It is intended that this will increase the true value of the interventions beyond the change in pollution at a static location and ensure the outputs are relevant in the real-world in terms of health and socio-economic effects rather than solely focusing on compliance of objectives. The review will comprise geospatial plots and commentary of key indicators for comparable ranking of deprivation and health.

2.3.2.2 Clean Air Zone/Low Emission Zones

Our experience working with other local authorities on the predicted behavioural effects of a LEZ or CAZ are that non-compliant journeys will either not happen, people will change their travel mode, or they will divert to an alternative route / destination. Where this reduces traffic demand within the geographical cordon it effectively

encourages compliant journeys, and although the overall effect may be relatively small with regard to the total traffic flows there will be improvements in vehicle emissions in the CAZ and close to the boundary. Defra's Plan for implementing a CAZ has defined four 'types' of CAZ to be considered by local authorities. The Plan also defines the equivalent Euro classification that should be applied as the minimum standard within the CAZ, whereby petrol engines should achieve Euro 4/IV and diesel engines Euro 6/VI, as shown in Table 2 below.

Table 2. JAQU CAZ Vehicle Classification Standards

Vehicle Type	Fuel	Equivalent Euro Classification
Cars	Petrol	Euro 4
	Diesel	Euro 6
LGV (Light Goods Vehicle, <3.5t)	Petrol	Euro 4
	Diesel	Euro 6
HGVs (Heavy Goods Vehicle > 3.5t,)	Diesel	Euro VI
Buses	Diesel	Euro VI

To represent the potential effects of a CAZ we will adjust the vehicle emissions profile in the EFT to create 100% compliant / non-compliant traffic flows and model these scenarios to indicate the maximum benefit / detriment that may be achieved. This will inform the type of CAZ that may be most effective; e.g. potentially a CAZ class B may be more viable than a more stringent CAZ class C or D.

We will run up to four ADMS models based on the CAZ-A, B, C and D classifications for a viable future implementation year; e.g. 2023. The results will be presented graphically to inform the potential geospatial boundaries that may be most effective, based on the extent of predicted local air quality effects; e.g. whole town, corridor, junction / gating. The CAZ scenarios are consistent with those defined by Defra and are intended to reduce NO_x emissions, although there will be some benefits to particulate emissions; i.e. PM₁₀ and PM_{2.5}, which are not specifically targeted by the CAZ-type measures.

At this stage it is understood that a CAZ may not be the most suitable solution subject to the local air quality effects that may be achieved due to the costs and socio-economic risks. However, it is expected the CAZ options would represent a core scenario to compare against alternative measures and to provide context for the effects of potential packages of interventions in terms of local air quality effects, costs, timescales and practical implementation.

2.3.3 Quantification of Measures

The measures that score most favourably based on the appraisal criteria will be quantified at this stage using a simple emissions adjustment approach in order to rapidly appraise a large number of potential scenarios and inform client decision-making and feedback. The costs include testing of up to 10 scenarios:

- The baseline ADMS dispersion model outlined above will be used to define the projected baseline.
- However, it is expected that detailed modelled traffic scenario data will not be available, and so it is proposed to apply emissions adjustments using the EFT to road link data to determine the effects, in terms of concentrations of NO₂, PM₁₀ and PM_{2.5}, on receptors.
- This approach is similar to that used in Air Quality Action Plan studies for many local authorities (e.g. Durham) and is considered to be appropriate and proportionate to ensure the best value for the project and to provide the essential data to effectively inform the decision-making process.

2.3.4 Preferred Package

The preferred package will be modelled using ADMS to validate the cumulative effects of multiple interventions and provide a definitive future implementation scenario. As discussed above, the CAZ scenarios may provide a benchmark to appraise the efficacy of a preferred package of measures.

2.4 Stage 4 Deliverables

We will produce a briefing document to accompany a technical report outlining our conclusions on the feasibility of introducing a CAZ or a package of other measures. The report will consider the opportunities and constraints of these measures, including the timescales for implementation and costs.

