OPTIONS APPRAISAL METHODLOGY REPORT

1. OVERVIEW

1.1 Context

Sheffield and Rotherham have been required by Government to tackle vehicle emissions from diesel vehicles and older petrol vehicles, to become compliant with legal NO_2 limits in the '*shortest possible time*'. Government propose the creation of 'Clean Air Zones' (CAZs) to tackle the main sources of pollution in local areas. Interventions can be designed to suit specific local challenges and needs. CAZs can involve charging drivers for entering a specific area in a vehicle that does not meet a specific minimum standard – broadly this means diesel vehicles that are older than Euro 6 (around 2016) or petrol vehicles that are older than Euro 4 (around 2006).

1.2 Initial Formulation of Long List of Options

We generated and examined a wide range of Clean Air Zone (CAZ) measures (the long list) to counter the specific sources of local exceedances.

The long list considered, localities/geographies of exceedances, and the activities and groups associated with the exceedances. It also examined a range of potential mitigation/service and charging solutions.

The long list was drawn up in consultation with a wide range of local and national stakeholders. Stakeholders invited to and attending the workshop and the wider stakeholder community are identified in Appendices B, C and H (document Appendices 20180329.pdf). Stakeholders were briefed on plans and policies, and background material included identification of exceedance levels, activities and geographies.

In total, some 80 different longlist schemes (or sub-schemes) were examined, and analysed in terms of modal and location coverage, desired outcomes and a series of key performance indicators. These are summarised in Appendix D of the Strategic Outline Case which was submitted in March 2018.

To reduce the long list to a short list, options and measures were judged against **Critical Success Factors**, namely compliance the key gateway criteria of compliance with Air Quality legislation in the shortest possible time (before 2021). Other Critical Success Factors included:

- Deliver value for money in terms of the funding required from Government
- Minimise economic impact with no one group overly affected more than any other by CAZ plans
- Ensure that options deliver required outcomes, whilst mitigating unwanted secondary consequences, for example avoiding displacement of air quality issues, or causing increases in CO2 emissions
- Ensure that there is alignment with wider strategies and policy for the city

To support our **assessment/reduction of longlist to shortlist**, we undertook, qualitative reviews, simple scoring based assessments (in line with JAQU processes) and detailed feasibility modelling. Our work covered collection of local data, undertaking local behavioural research, and use of JAQU and DfT data sets and accounted for planned developments in the region. Schemes covered a wide

variety of mitigation measures, charging schemes and areas of coverage. Our write up of the process can be found in the Strategic Outline Case which was submitted in March 2018.

1.3 The Rejected Options

Through our comprehensive analysis of various 'mitigation' options, we ruled out any options that did not include a 'charging' element. This is because without directly targeting tailpipe emissions, we would need an unprecedented and immediate change in how people choose to get around the city; with people not using their private car and investment in substantial public transport, Park & Ride, walking & cycling infrastructure in order to cope with this shift in behaviour. Whilst supporting a significant shift towards public transport and active travel is part of Sheffield and Rotherham's Transport Strategy ambitions, we have judged that achieving such a shift and implementing the necessary infrastructure would not enable Sheffield to achieve compliance with our legal air quality duties (shortest possible time and by no later than 2021).

1.4 Shortlisted Options

This left us with a final group of CAZ (Clean Air Zone) shortlisted options, with a range of vehicles potentially included.

CAZ Charging Class	Vehicles potentially included
CAZ A	Buses, coaches, taxis and private hire vehicles
CAZ B	Buses, coaches, heavy goods vehicles (HGVs) taxis and private hire vehicles
CAZ C	Buses, coaches, HGVs, large vans, minibuses, small vans/ light commercials, taxis and private hire vehicles
CAZ D	Buses, coaches, HGVs, large vans, minibuses, small vans/ light commercials, taxis and private hire vehicles, cars, motorcycles and mopeds

Vehicles that do not meet minimum emission standards (i.e. non-compliant) will be charged a daily rate if they enter or move within a charging CAZ.

Vehicle type	CAZ minimum emission standards
Buses and coaches	Euro VI
Heavy Goods Vehicles (HGVs)	Euro VI
Vans (Light Goods Vehicles)	Euro 6 (diesel) or Euro 4 (petrol)
Cars	Euro 6 (diesel) or Euro 4 (petrol)

The final options shortlisted were made up of

- CAZ D inside Charging Area 1, defined as an area stretching from Sheffield's Inner Ring Road to the A630 through Rotherham, but excluding the M1 motorway – see Figure 1 below for details – referred to here as Option CAZ 1D;
- CAZ D inside Charging Area 2 (created by excluding Rotherham from the Charging Area 1, as shown in Figure 1 below) plus a set of targeted measures designed to address a set of air quality hot-spots in Rotherham – referred to here as CAZ 2D;

- A CAZ D inside Charging Area 3 (defined as the area inside (and including) Sheffield's Inner Ring Road – see Figure 2 for details), plus the local Rotherham measures included in CAZ 2D – referred to here as CAZ 3D; and

- A CAZ C (i.e. excluding private cars) inside Charging Area 3 plus the local Rotherham measures plus a set of additional measures designed to further-reduce NOX emissions at a number of air quality hotspots in central Sheffield – referred to here as CAZ 3C^{+}

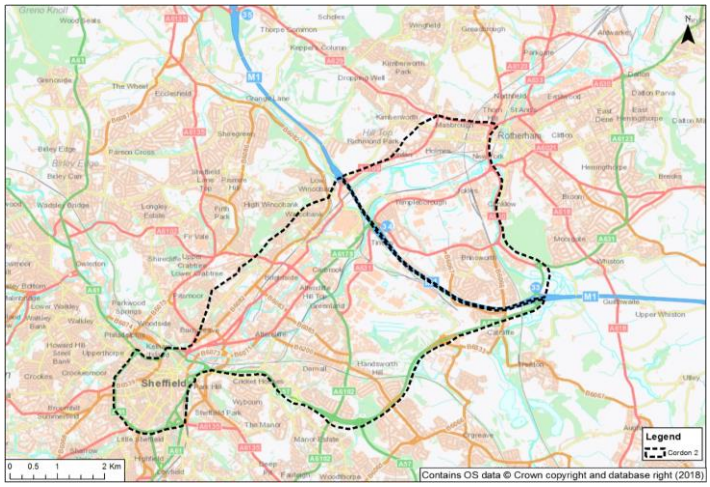

Figure 1 Potential Charging Areas 1 and 2

Figure 2 Potential Charging Area 3

These and a range of associated mitigating measures are described in detail in the main Economic Case and in Supporting Document OBC_SD17 (Contents of the Preferred Option).

2. GENERAL APPROACH TO THE APPRAISAL OF OPTIONS

2.1 Health and Environmental Impacts

2.1.1 We have used the 'Damage Cost'-based method as implemented in the Air Quality Valuation spreadsheet downloaded from Huddle on 26 November 2018 to appraise the monetary value of the change in NOX and PM10 in six distinct geographic areas, defined by the three charging areas described above, as follows:

- Central Sheffield - The area inside and including Sheffield's Inner Ring Road;
- Rest of CA2 - the remainder of Sheffield which is inside Charging Area 2;
- Rest of Sheffield – the areas of Sheffield which lie outside Charging Area 2;
- Rotherham Inside Charging Area 1 – the area of Rotherham which lies inside proposed charging area 1;
- Rest of Rotherham – the area of Rotherham which lies outside CA1; and
- J33-J35 of the M1 – ie the section of the M1 which passes between the two parts of Charging Area 1 (but which is excluded from the CAZ restrictions).

2.1.2 These six emissions aggregation areas are illustrated in Figure 3 below.

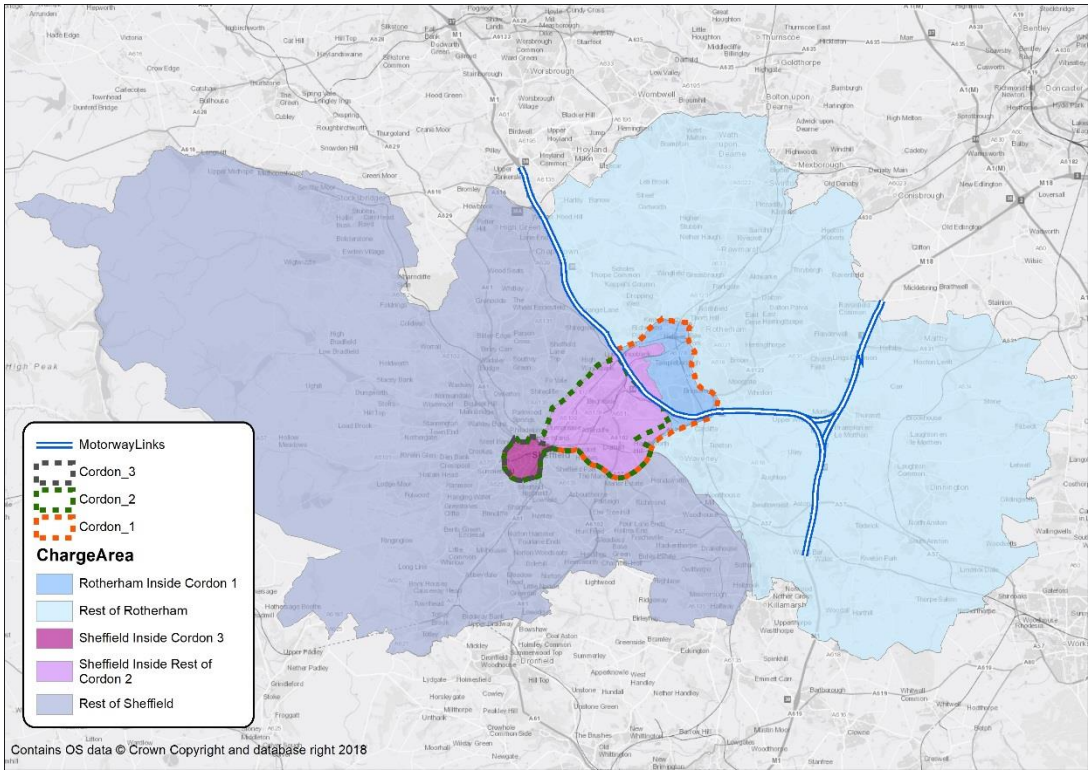

Figure 3 The Geographic Areas Which Will be Used to Aggregate Emissions Impacts

2.1.3 The change in emissions in each of these areas between the Business as Usual and the various Do Something scenarios have be estimated for 2021 and 2024, using outputs from SYSTRA's ENEVAL software applied to link-based flows and speeds from the SRTM3B traffic models.

2.1.4 Linear interpolation and extrapolation has been used to estimate the relevant changes in emissions in other years.

2.1.5 No attempt has been made to estimate the reduction in emissions in any years prior to 2021, for example as a result of the introduction of any complementary 'early measures'.

2.1.6 We have used the JAQU Air Quality Valuation spreadsheet to monetise the changes in 'Damage Cost' of emissions of both NO_X and PM_{10}s and have liaised with JAQU to agree an approach to avoid the double-counting of mortality (&/or any other) impacts of these two pollutants.

2.2 Consumer Welfare and Traffic Flow Impacts

2.2.1 The DfT's TUBA software (version v1.9.11) has been used to take outputs from the SRTM3B multi-modal model for 2017, 2021 and 2024 to estimate the benefits and disbenefits associated with:

- The imposition of a daily charge on non-compliant vehicles affected by the relevant CAZ scheme;
- The impacts of non-compliant vehicle 'through trips' rerouting to avoid the CAZ charges; and
- The decongestion benefits arising from any reduction in traffic as a result of the imposition of the CAZ and/or the introduction of the complementary measures.

2.2.2 The assumed profile of these benefits and disbenefits is as follows:

- No benefits/disbenefits have been assumed prior to 2021;
- The benefits/disbenefits in 2021 have derived using traffic skims generated by interpolation between the relevant 'synthetic Do Something' in 2017 and the relevant 2024 Do Something transport models - ie using the 2021 point on the post-Do Something trajectory of travel costs;
- The benefits/disbenefits between 2022 and 2024 have been derived using linear interpolation (in TUBA) between the 2021 and 2024 TUBA inputs;
- The benefits/disbenefits from 2025 onwards have been assumed to be zero (ie we are assuming that:
    a) the Do Something fleets will have converged back to the Business as Usual fleets by 2025 (so no emissions-related benefits beyond 2024)
    b) the operation of the CAZ charging scheme will stop on 31 December 2024 (so no impacts from the impact of the charging area on traffic flows or mode choice etc); and
    c) any other component of the Do Something will either stop on 31 December 2024 or be implemented as part of the Business as Usual on 1 January 2025.