Transport and Environment Committee

10.00am, Thursday, 17 June 2021

Low Emission Zone – Preferred Scheme for Consultation

Executive/routine	**Executive**
Wards	**All**
Council Commitments	18

1. Recommendations

1.1 This report recommends that Transport and Environment Committee:

1.1.1 Approves the Preferred Low Emission Zone Scheme (LEZ) for consultation over the summer;

1.1.2 Acknowledges that the Preferred LEZ Scheme has been defined using an evidence-based approach, as required by the National Low Emission Framework;

1.1.3 Agree the objectives set out for the Preferred LEZ Scheme for Edinburgh (in section 4.17);

1.1.4 Agrees to develop a local LEZ campaign, as part of the communications and engagement process which links to the national campaign 'Get Ready' for LEZs;

1.1.5 Notes that the findings from the consultation on the Preferred LEZ Scheme to be held over summer will be brought back to Committee for consideration in autumn; and

1.1.6 Agree to progress work on the design and development of an enforcement system for the Preferred LEZ Scheme, and to capitalise on available funding from Transport Scotland.

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Report

Low Emission Zone – Preferred Scheme for Consultation

2. Executive Summary

2.1 Low Emission Zones (LEZs) in Scotland are mandated by The Scottish Government to reduce longstanding exceedances of legal air quality objectives (Nitrogen Dioxide, (NO_2)) originating from urban road traffic. LEZs help to improve air quality by discouraging the most polluting vehicles from entering an area, which will help improve public health and wellbeing.

2.2 The National Low Emission Framework (NLEF) requires an evidence-led approach to ensure LEZs tackle areas where Scottish Air Quality Objectives (AQOs) are exceeded, or are likely to be exceeded, and transport is identified as the key contributor. Three LEZ scheme options have been appraised in accordance with the NLEF and the relevant regulations to identify a Preferred LEZ Scheme for Edinburgh, namely a City Centre Low Emission Zone.

2.3 The Scottish Government and the four major Scottish Cities (Aberdeen, Dundee, Edinburgh and Glasgow) have agreed an indicative timeline to implement LEZs by Spring 2022, taking account of the impact of the COVID-19 pandemic. LEZs will be operational once agreed grace periods have expired. A grace period of two years is proposed for Edinburgh's LEZ scheme, which means enforcement of the LEZ will, subject to approval, commence in Spring 2024.

2.4 The Council has progressed a range of assessment and analysis work to develop the Preferred LEZ Scheme in partnership with neighbouring authorities, the regional transport authority (SEStran), Transport Scotland and the Scottish Environmental Protection Agency (SEPA).

2.5 Assessing the potential air quality impact of the LEZ forms the significant evidence-base for LEZ development, as defined by the National Modelling Framework (NMF). Traffic modelling has also informed the NMF together with the wider Integrated Impact Assessment work, financial analysis and general feasibility and deliverability considerations.

2.6 An Integrated Impact Assessment has been developed alongside the development of the Preferred LEZ Scheme to establish the impacts of the proposals on individuals and groups. The findings of this work highlight the need to ensure support for groups that are most affected, and that time is given (a grace period) to

ensure people are well informed and have time to prepare, prior to enforcement beginning.

2.7 Subject to Committee approval, a public consultation on the Preferred LEZ Scheme will be undertaken for a period of 12 weeks. As part of this process, further engagement will be held with key stakeholders who may be affected to ensure the success of the LEZ Scheme going forward.

2.8 The results of the consultation and stakeholder engagement will inform a report to Committee in the autumn, prior to commencement of the statutory processing to create a Low Emission Zone.

2.9 A Low Emission Zone Scheme in Edinburgh will need to be implemented in conjunction with wider transport policies and measures to complement behaviour change towards more sustainable transport.

3. Background

3.1 Air quality in Edinburgh is improving year on year, but there are still areas across the City where air quality standards for human health are not being met. Road transport in the urban areas remains a significant contributor to poor air quality. Air pollution especially impacts on the more vulnerable members of society - the very young and the elderly or those with existing health conditions such as asthma, respiratory and heart disease. This makes air quality an important health inequalities issue.

3.2 Air pollution, climate change, quality of the urban environment and mobility are strongly interconnected. It follows that effective policy co-ordination across these broad themes, at both central and local government levels, will deliver co-benefits greater than those possible by considering each in isolation.

3.3 The Cleaner Air for Scotland – The Road to a Healthier Future (CAFS) is a national cross-government strategy that sets out how the Scottish Government and its partner organisations propose to reduce air pollution further to protect human health and fulfil Scotland's legal responsibilities as soon as possible.

3.4 A key element of the current CAFS strategy is the National Low Emission Framework (NLEF), which was published in January 2019. The NLEF provides a methodology for local authorities to undertake assessments in relation to transport related actions to improve air quality, where transport is identified as the key contributor to local air quality problems. It is designed to support and build on the work already being done through Air Quality Action Planning, as defined by the Local Air Quality Management (LAQM) regime.

3.5 Completion of NLEF screening assessments is a component of the 2017/18 Programme for Government (PfG) commitment that Scottish Government will 'with local authorities, introduce Low Emission Zones (LEZs) into Scotland's four biggest cities between 2018 and 2020, and into all other Air Quality Management Areas (AQMAs) by 2023, where the NLEF appraisals advocate such mitigation'.

3.6 As guided by Scottish Ministers during the COVID-19 pandemic response, LEZ progress work paused, before agreement was reached to set a new indicative timeline for LEZ implementation in the four major Scottish Cities. LEZs are now to be introduced across Edinburgh, Aberdeen, Dundee and Glasgow between February and May 2022.

3.7 The Council continues to work in close partnership with Scottish Environment Protection Agency (SEPA) and Transport Scotland to assist in the work of the National Modelling Framework (NMF) which is also a key element in CAFS. The NMF aims to standardise data collection requirements, analysis process and presentation of outputs to provide local authorities with information required to appraise measures for improving urban air quality, in a consistent method across Scotland.

Low Emission Zone Scheme Development

3.8 In Edinburgh, the Low Emission Zone scheme development has also been progressed alongside the Council's new local transport strategy (City Mobility Plan) and Edinburgh's City Centre Transformation in order to fulfil the Council's integrated strategic ambitions. Together these projects aim to improve health, wellbeing, placemaking and connectivity and have a key focus on prioritising sustainable travel choices to support the city's 2030 net zero carbon target, reducing the need for private car use and creating more pleasant environments for people to live, work and enjoy leisure time.

3.9 The City Mobility Plan confirms a commitment to developing a LEZ scheme along with other new and related measures aiming to tackle congestion and support cleaner air, including freight rationalisation, Workplace Parking Levy (subject to consultation), and, if necessary, a 'Pay as you Drive' scheme. A further range of initiatives are already in place to support the move towards low emission transport. These include investment in public transport including Trams extension, expansion of the active travel network, electric vehicles charging infrastructure, expansion of controlled parking zones and the parking permit diesel surcharge. The phasing out of older taxi and private hire vehicles is also being supported by the licensing regime.

3.10 In May 2018, Committee agreed to work with The Scottish Government and other partners to take forward a comprehensive approach to establishing LEZ in Edinburgh. Committee has since received the following reports related to air quality and LEZ development:

3.10.1 August 2018 agreeing to joint CMP, LEZ, and CCT consultation through 'Connecting our City, Transforming our Places' including options for a city centre and city-wide LEZ boundary.

3.10.2 December 2018, provided the Council's Annual Air Quality Update and reported a continuing trend towards compliance with legal limits. However, exceedances remain across the city, with the Central AQMA having the highest concentration of sites that exceed legal limits.

3.10.3 February 2019, summarised the findings of Connecting our City, Transforming our Places consultation and set out how the findings would shape the next stages of delivering CMP, LEZ, and ECCT.

3.10.4 In May 2019, the Committee agreed to public consultation and stakeholder engagement on LEZ proposals to be held between May and July 2019.

3.10.5 In October 2019, the Committee noted the main findings following the consultation on a proposed Low Emission Zone (LEZ) scheme.

3.10.6 December 2019 and January 2021 Air Quality Annual Progress Reports have also been noted.

Edinburgh's Low Emission Zone Scheme Consultation 2019

3.11 A public consultation on LEZ proposals ran between 27 May and 21 July 2019. The findings can be found in the above-mentioned report.

3.12 The consultation sought people's views on a city centre LEZ applying to all vehicle types, introduced within a short grace period (one year), to tackle the worst concentrations of air pollution in the densely populated area. In addition, an Extended Urban Area boundary (referred to at that stage as the 'Citywide boundary') was put forward to apply to all commercial vehicles - buses, coaches, HGVs, LGVs, vans, taxis, and private hire cars - with a longer time to prepare (three years). Private cars were scoped out of the proposals following the initial NMF process.

3.13 The consultation asked for feedback on the proposed boundaries for the zones, the specific vehicles the zones would apply to, and the amount of time vehicle owners would have before enforcement begins (grace periods).

3.14 Overall, findings from the consultation showed that cleaner air is important to all, but there were mixed views as to the suitability of the LEZ and to its specific aspects. General public and commercial audiences agree, albeit with differing priorities. For all however, vital questions to consider are the cost of LEZ compliance to them; the cost to life in Edinburgh (clean air, goods/services); and looking at a bigger, city and regional picture to tackle underlying issues (traffic flow, public transport, etc).

Development of Legislative Framework for Low Emission Zones

3.15 In May 2021, the regulations to give local authorities detailed powers under the Transport (Scotland) Act 2019 to create and enforce LEZs became law.

3.16 The Low Emission Zones (Emission Standards, Exemptions and Enforcement) (Scotland) Regulations 2021 cover the topics of emission standards, exemptions, penalty charge rates, and enforcement, and the Low Emission Zones (Scotland) Regulations 2021 cover consultation, publication and representations, examinations, approved devices, and accounts.

3.17 All vehicles outlined in the scope of a scheme, which meet the minimum emission standards may freely enter the LEZ and are defined as 'compliant'. Any vehicle within the scope of the scheme which does not meet the minimum emission

standard will be subject to penalties according to the Regulations and are defined as ‘non-compliant’.

3.18 Emission standards for LEZs, defined in the regulations are categorised by Euro standards and fuel type, as summarised;

3.18.1 Euro 6: diesel cars and light goods vehicles (generally those registered from September 2015);

3.18.2 Euro 4: petrol cars and light goods vehicles (generally those registered from January 2006);

3.18.3 Euro VI; HGVs, buses/coaches

3.19 As these are minimum standards, it should be noted that zero emission vehicles including electric and hydrogen powered vehicles, would also be considered compliant.

3.20 Emissions standards are sufficiently significant to introduce a LEZ that is ambitious, equivalent to the London Ultra Low Emission Zone and Paris (2022 to 2024).

3.21 Scotland’s LEZs will follow a penalty enforcement regime and seek to catalyse behaviour change towards sustainable travel. This differs from the approach of England’s Clean Air Zones (CAZs), which allow access based on a daily charge (e.g. £12.50 in London) and penalties are issued if the access charge is not paid.

3.22 The Scottish system aims to deter any non-compliant vehicle from entering a zone, with penalty charges escalating for repeat offences. Penalties are set nationally as dictated by the regulations. An initial charge for any non-compliant vehicle driving within a LEZ is £60, however the penalty rate approximately doubles for each subsequent contravention within a 90-day period, up to £420 for light passenger/commercial vehicles and £900 for heavy duty vehicles.

3.23 Scotland’s LEZs are not designed to generate income and are predicted to yield zero or low revenue for the Council, due to these set of rules to discourage further contraventions.

4. Main report

Tackling Air Pollution in Edinburgh

4.1 Ongoing review and assessment of local air pollution across the City identifies a general downward trend of pollution concentrations, in particular traffic related Nitrogen Dioxide (NO_2).

4.2 The Council’s Air Quality Annual Progress Report, as defined by statute under the Local Air Quality Management regime, details the progress the Council is making on actions which affect air quality. Coupled with improvements in the natural turnover of fleet, the cumulative impact of such measures are successful in reducing and maintaining the levels of NO_2 to below statutory objectives in some areas.

4.3 The 2020 Annual Progress Report confirmed that the Council is set to amend the Air Quality Management Area (AQMA) at St John's Road this year (2021) as the statutory hourly Objective for NO_2 has been met for the past four years. The statutory annual mean Objective however remains breached. Revoking the AQMAs in full, at Inverleith Row and Great Junction Street is also under consideration. These were declared for breaches of the annual mean Objective, which has been met for two and three years, respectively.

4.4 Every local authority that has an active Air Quality Management Area (AQMA), is required under Part IV of the Environment Act 1995 to provide an Air Quality Action Plan (AQAP) as a means to address the areas of poor air quality. The Council's Nitrogen Dioxide AQAP is being devised concurrently with the LEZ Scheme proposal, so that it features as a principle action in the Plan.

4.5 The Plan will address traffic emissions across the City but can also include targeted interventions in the other AQMAs. Feasibility work has been undertaken for junction improvements that would reduce traffic queueing and pollution concentrations further in the St John's Road AQMA. Part-funding has been awarded from Scottish Government to progress this work in 2021/22.

4.6 The Council has undertaken a range of work in relation to developing the Preferred LEZ Scheme, from the 2019 public consultation and stakeholder engagement to working in partnership with neighbouring authorities, SEStran, Transport Scotland and SEPA, through the Council's own LEZ Delivery Group. National governance arrangements are also set-up for the delivery of LEZs in Scotland including transport Scotland's 4-Cities Consistency Group and a Leadership Group, chaired by ministers.

4.7 The report described herein presents the findings of the assessment work which defines the Preferred Scheme for Edinburgh.

National Modelling Framework (NMF)

4.8 SEPA is supporting local authorities throughout the assessment and the decision-making process, through the development of the NMF local model. The local models utilise ADMS-Urban, a recognised system that is used around the world for modelling all aspects of air pollution across urban areas.

4.9 This air dispersion modelling is supported by traffic modelling undertaken using the Council's strategic VISUM model suite.

4.10 SEPA was subject to a serious and complex criminal cyberattack in December 2019, that significantly impacted their internal systems and air quality modelling capabilities. As part of the recovery plan, the delivery of the NMF obligations to assist in the final assessments of the LEZ options for the Scottish cities, was considered priority.

4.11 Although SEPA has been unable to complete and formally report on the full NMF air dispersion modelling work, it has been possible for them to provide an interim report based on the Edinburgh local model, derived from a presentation to officials prior to the cyberattack (SEPA, April 2021). This is presented in Appendix 1.

4.12 An alternative approach to allow the four Scottish local authorities to progress assessment work during the early part of 2021 was discussed at the LEZ Leadership Group meeting held in February 2021. The following steps were recommended by the Scottish Government and SEPA on a way forward and agreed by the group which includes Health Protection Scotland and the local authorities involved in the national LEZ Programme;

4.12.1 Continuation of traffic modelling to define a small number of potential LEZ options or a Preferred LEZ option for each city.

4.12.2 Emissions analysis on the traffic model outputs using the established NMF methodology. This will assess the impact of the LEZ by comparing traffic and traffic related emissions between the reference (baseline) and LEZ options.

4.12.3 SEPA would continue to undertake detailed air dispersion modelling during the consultation phase over the summer of 2021 to support the local authorities in finalising the preferred LEZ scheme for Committee and Ministerial approval in late 2021 and early 2022.

4.13 In response SEPA have also produced an NMF Emissions Analysis Report for Edinburgh (Appendix 2).

4.14 This information coupled with the following appraisal has helped inform the preferred Scheme for Edinburgh.

Appraisal Approach

4.15 LEZ schemes in Scotland are statutorily obliged to include two objectives in relation to emissions reduction.

4.16 The Council also exercised discretionary powers with partners, to agree a further three objectives. Developed with the initial LEZ consultation in 2019, these aim to minimise the impact from any traffic diverted as a result of a LEZ boundary and to encourage behavioural changes to ensure more sustainable travel.

4.17 The LEZ Scheme objectives for Edinburgh are;

4.17.1 Contribute towards reduction of NO2 emissions in fulfilment of section 87(1) of the Environment Act (1995)

4.17.2 Contribute towards reduction of greenhouse gas emissions in fulfilment of Part 1 of the Climate Change (Scotland) Act 2009

4.17.3 Minimise the impact from traffic displacement across network, related to LEZ scheme

4.17.4 Strategically align with Council sustainable transport, active travel and placemaking objectives

4.17.5 Strategically align with national funding provision policies, supporting individual and business adaptation.

4.18 A National Low Emission Framework appraisal, incorporating these objectives and other key principles was considered against a number of options for the Edinburgh LEZ Scheme. These options are highlighted below;

3.17.1 Option 1 – City Centre LEZ – Original Boundary as proposed for the consultation undertaken in 2019, with minor amendments.

3.17.1 Option 2 – City Centre LEZ – Revised Boundary as a feasible alternative to the original boundary.

3.17.1 Option 3 – City Centre and Extended Urban Area LEZs. This included either one of the above City Centre boundaries, plus the addition of a boundary covering the wider urban area, roughly within the City Bypass. This has previously been called the Citywide boundary. This option was also proposed as a part of the consultation in 2019.

4.19 The inclusion of a grace period was also considered during appraisal process as it forms a statutory requirement of the Scheme.

4.20 Consideration of the different vehicle types is also detailed.

4.21 Appendix 3 details the NLEF appraisal document.

Preferred LEZ Scheme for Edinburgh

4.22 The appraisal concluded that Option 1 – City Centre LEZ is the preferred scheme for implementation in Edinburgh.

4.23 The preferred scheme details are summarised in Appendix 4.

Boundary

4.24 The LEZ boundaries considered in the options appraisal were developed based on the findings of the NMF. An additional consideration was to provide a clear, logical, and readily signposted diversion route for non-compliant vehicles. Drivers need to be able to travel round the LEZ boundary, so that they can avoid being penalised by choosing not to enter the zone.

4.25 The NMF process coupled with feedback from the previous consultation process, highlighted significant impacts that could arise with the Original boundary, especially in relation to air quality on Palmerston Place and Chester Street on the western part. Traffic on these streets would increase and the proportion of non-complaint vehicles would also increase, as vehicles choose to divert rather than enter the zone. This led to consideration of the Revised Boundary. A detailed NMF analysis of the City Centre boundary options was undertaken.

4.26 The analysis indicated that in the long-term (future scenario) the impact on Palmerston Place and Chester Street is not sustained. This is likely to be due to less non-compliant traffic needing to use the diverted route, as well as vehicle standards generally improving.

4.27 The Revised Boundary which includes Lothian Road/Charlotte Square as the main western boundary, showed that existing air quality issues on Lothian Road would be exacerbated and that in the future scenario, these issues would not be resolved. This indicates that it would take a much longer time to resolve the existing air quality problems on Lothian Road.

4.28 Consideration of residential and commercial addresses along those streets most impacted streets by the two boundary options highlighted a greater amount of residential and commercial properties with the Revised boundary. These streets are also busy urban centres with a significant amount of shops and retail. The impact of the Revised boundary could therefore be more significant.

4.29 Overall, both the Original and Revised boundary options will improve air quality in the City Centre. Compared to a 'No LEZ' scenario, it is predicted that there will be 75% fewer model exceedance points in the City Centre and 50% fewer model exceedance points across the whole of the City (SEPA, April 2021).

4.30 Within the City Centre either option would reduce NOx emissions from traffic sources, by 55% (equivalent to 25-30 tonnes/year), when compared to 2019 levels. For areas that are not in the LEZ, it is predicted that NOx emissions from traffic sources will comparably decline by 15%.

4.31 The introduction of a City Centre LEZ does not significantly change predicted air quality concentrations in AQMA's outwith the City Centre e.g. Leith, Corstorphine, due to displaced traffic.

4.32 Overall, the findings of the appraisal recommended that implementation of the Extended Urban Area boundary, which would affect commercial-type vehicles, should not be progressed.

4.33 Air Quality improvements are already being realised across the City, which is having a positive benefit on the status of the AQMAs outwith the City Centre.

4.34 An analysis of the Edinburgh fleet composition showed that there were significant improvements already made in the commercial-type fleet. There is likely to be acceptability in industry that LEZs are coming with the national and local campaigning. In London air quality benefits had been realised prior to the enforcement of the LEZ. Prior to the Ultra LEZ implementation, a 20% decrease in nitrogen dioxide was recorded as taxis, buses and delivery vehicles were upgraded. In Leeds, pre-scheme gains were thought to be sufficient and a Clean Air Zone was cancelled in 2020.

4.35 In Edinburgh, traffic surveys undertaken in February 2020 showed, Heavy Goods Vehicles (HGVs) were 76-95% compliant. Light Goods Vehicles (vans) increased in compliance from 7% in 2016 to 48% in 2020.

4.36 The IIA identified the potential economic costs of replacing vehicles a high priority for the Extended Urban Area impact. Commercial-type vehicles will be most significantly affected due to their inclusion. According to Federation of Small Businesses figures, Scottish Small and Medium Sized Enterprises (SMEs) are heavily reliant on cars, vans and lorries for their daily operations and travelling into work. The introduction of a LEZ would impact SMEs in different ways due to the varied nature of the businesses and the Extended Urban Area boundary would have more of an impact in this regard.

4.37 Small enterprises represent over 90% of businesses in Edinburgh. Sixty three percent of companies rely upon vehicles, most likely LGVs, to deliver goods or drive

to clients to provide a service, therefore, this sector where non-compliance rates are at 48% could be disproportionately affected by the Extended Urban Area boundary.

4.38 Over 60% of the bus and coach fleet (excluding Lothian Buses) was compliant in February 2020. Lothian Buses, who are responsible for the majority of trips with these types of vehicles in the City, are committed to reaching compliance with the LEZ requirements by the end of 2021. As the majority of buses and coaches will be affected by the City Centre LEZ boundary, the Extended Urban Area boundary would have limited impact on this sector.

4.39 In conclusion, the City Centre area has the greatest magnitude of traffic related pollution problems and breaches of statutory Air Quality Objectives (AQOs). Options 1 and 2 support compliance with AQOs and are supported by a strong evidence-base which highlights the Central Air Quality Management Area (AQMA) as the focus for targeted interventions.

4.40 Option 1 – the Original boundary - is preferred for delivering air quality improvements since it includes a wider population and a larger portion of the City Centre, including greater coverage of the Central AQMA.

Scope of Vehicle Types

4.41 Due to the scale of existing air quality exceedances in the City Centre, it was deemed appropriate to include all vehicles, except motorcycles and mopeds, in the Preferred LEZ Scheme. Therefore, the scope of vehicle types to be included are as follows: cars (light passenger vehicles), minibuses, buses and coaches, LGVs and HGVs.

Grace Period

4.42 A grace period of two years will begin on the start date and will apply to all vehicle types included in scope.

4.43 This means, with the start date currently Spring 2022, enforcement would commence in Spring 2024, following the two years grace period.

4.44 The legislation supporting LEZs stipulates that there must have a minimum of 1-year grace period. The appraisal identified a further one-year period would be necessary in order to support the economic recovery relating to COVID-19 impacts. This time would also facilitate transport infrastructure changes that are required for the boundary to function efficiently and allow for a review of any road construction considerations.

Wider Considerations

Traffic Network Management

4.45 One of the main issues with a LEZ is the concern that air pollution gets worse outside the zone due to vehicles diverting around the boundary, rather than entering the Zone. Experience from London and cities in Germany show that the cleaner vehicles are also used in the surrounding area, spreading the benefit.

4.46 The NMF assessment work shows that the air quality in the AQMAs outwith the City Centre will not worsen as a result of a City Centre LEZ, however, as highlighted above, there is potential for localised impact.

4.47 To account for these potential impacts, the NMF considered the traffic modelling in detail which considers changes in traffic flow, as well as fleet composition (see Appendix 5 Traffic Modelling Report).

4.48 In order to mitigate against these impacts and ensure the traffic network functions effectively, without providing significantly additional capacity, the Council is developing a Network Management Strategy. The main aim is to minimise the impact from traffic displacement across network from the operation of the LEZ.

4.49 Mitigation measures to be brought forward as a part of this strategy are likely to include junction reconfiguration (Toll cross, Pleasance/Holyrood/St Mary's Street), road changes (two way on Morrison Street), reconsidering loading needs (Palmerston Place), optimised signal staging (Palmerston Place/Chester Street, Easter Road/Abbey mount, Abbeyhill), improved signing, overnight lorry ban (Great Stuart Street/Ainslie Place) and rationalisation of pedestrian crossings or links to Urban Traffic Control (Pleasance).

4.50 Junction improvements are already being developed for Drumsheugh Gardens / Lynedoch Place / Randolph Crescent and Lothian Road. These will be reviewed to ensure LEZ traffic change demand is accommodated.

4.51 A robust monitoring regime will also form part of the network management strategy and may cover public transport journey times, traffic surveys and public opinion surveys – see further details below.

Other considerations

4.52 Despite the potential for accelerated improvement in vehicle standards with a LEZ, it will be difficult to meet the statutory Air Quality Objectives in some areas of the Central AQMA. Busy narrow streets with tall buildings will be particularly challenging. In these locations, other measures to reduce emissions will be required. It will be important to align the Councils portfolio of strategic traffic and public realm improvement projects with the LEZ delivery and Air Quality Action Planning work. This is particularly pertinent with a City Centre LEZ and the emerging Edinburgh City Centre Transformation programme.

4.53 The Preferred Scheme aligns well with the City Mobility Plan (CMP). With the City Centre LEZ including cars this will support strategic measures for encouraging modal shift from private cars to more sustainable forms of transport. In turn, this supports the development of public transport and active travel infrastructure as well as contributing to the net zero greenhouse gas target.

4.54 Greenhouse gas reduction and carbon emission-free mobility is a fundamental element of CMP and the Council will continue to promote and encourage new and zero emission vehicle technologies including the appropriate charging infrastructure with the Strategy delivery. This will help off-set any implications from encouraging

fossil-fuelled LEZ vehicle compliant vehicles and the need to work towards net-zero carbon targets for 2030.

4.55 The unprecedented changes in living and working patterns from the impact of COVID-19 are likely to have had a significant, but as yet unquantified, effect on air pollution.

4.56 In Scotland, during the main lockdown period in 2020, nitrogen dioxide levels declined. Transport Scotland commissioned a study 'LEZ Post-COVID Uncertainty' (See Appendix 6) which considered four plausible futures (with varying traffic demand and vehicle compliance levels) against the NMF model assessments for the four Scottish Cities. The ongoing assessment work for Edinburgh was found to be robust to variations in network conditions that may occur in a post-pandemic world. The study also concluded LEZs are still required to improve air quality and protect the City Centres.

4.57 The case to ensure LEZ are progressed in a timely manner can be supported by considering some of the future fleet projections. Taking account of the post-COVID uncertainty and accepting the fact that national fleet projections should be treated with caution (SEPA, 2018), as an estimate, there could be approximately 20,000 non-compliant vehicles in the Edinburgh Travel to work area in a near-future scenario. This is based on the following details obtained from the data from the 2023 National Atmospheric Emission Inventory;

- 16,000 cars (diesel) (22%)
- ~3610 LGV (18%)
- ~120 HGV (8.4)

4.58 In order to ensure LEZ are effective and provide value for money in their implementation, they should be implemented without further delay.

4.59 The simplicity of the Preferred Scheme (with one boundary and one grace period for all vehicle users), will provide the added benefit of ensuring clear communication and engagement with public and stakeholders. An evidence based, targeted air quality intervention with a relatively concise geographical area, provides a step-change approach to emissions control in Edinburgh. The chosen approach can help build public confidence in evidence-backed interventions.

Funding support

4.60 Funding to support the implementation of LEZs is being made available by the Scottish Government on a year on year basis.

4.61 The LEZ Support Fund and Travel Better vouchers are available to households on specific means-tested benefits within a 20km radius of a planned LEZ. If eligible a £2,000 cash grant can be awarded towards the disposal of non-compliant vehicles. Successful households can also apply for a further £1,000 Travel Better vouchers for sustainable travel alternatives. Options include bus passes, train season tickets, new and used bikes, as well as car club membership and credits.

4.62 The LEZ Support Fund for Businesses is geared towards micro businesses and sole traders, with an operating site within 20km of a LEZ. A £2,500 cash grant towards the safe disposal of non-compliant vehicles is available.

4.63 The LEZ Retrofit Fund will provide micro businesses, who operate within one of Scotland's four proposed low emission zones, with support to retrofit their existing non-compliant vehicles with Clean Vehicle Retrofit Accreditation Scheme (CVRAS) approved solutions. Grants are available to cover up to 80% of the cost.

4.64 The following funding streams have been awarded in relation to Edinburgh's LEZ plans in 20/21 financial year:

4.64.1 Funding support for low income households just over £80,000;

4.64.2 Funding for small/micro businesses £282,500;

4.64.3 Retrofitting (nearly all taxis) £300,000.

4.65 These schemes have been established again for the 2021/22 financial year.

4.66 To support the introduction of LEZs across the bus and coach sector, BEAR - the Bus Emissions Abatement Retrofit - Programme has supported operators with the cost to retrofit vehicles with CVRAS technology. This funding has been available to licensed bus and coach operators, community transport providers and local authorities. The Programme was oversubscribed in the 20/21 financial year, when approximately £9.75 million awarded across Scotland. It is anticipated that a BEAR 4 scheme will be announced for the current financial year so that this support can continue.

Wider Scheme Development

<u>Exemptions</u>

4.67 National exemptions to the scheme, are outlined in the regulations and include emergency service vehicles; naval, military and air force vehicles; historic vehicles; vehicles for disabled persons (including blue badge holders); and showman vehicles.

4.68 The Council may grant and renew time-limited exemptions in respect of a vehicle or type of vehicle. In doing so, the registered keeper of the vehicle would be exempt from LEZ enforcement for the period that the exemption applies, which may be no more than 1 year, on each occasion.

4.69 To encourage compliance and protect public health, exemptions are to be granted only in exceptional circumstances.

4.70 Through findings of the Integrated Impact Assessment work and discussion with stakeholders, low-income workers, for example care workers, could be considered for time-limited exemptions. The statutory consultation process will explore the impact of the Scheme on affected groups, to inform any policy to support the Scheme implementation.

Hours of Operation

4.71 The scheme will operate 24 hours, 7 days a week, all year round. This is the default position of Scottish LEZs, as outlined in the draft guidance issued by Transport Scotland.

Enforcement

4.72 The Council's local enforcement strategy seeks to ensure compliance with the Scheme is maximised, to achieve and exceed LEZ Scheme objectives. In conjunction with the regulations and guidance, Automatic Number Plate Recognition (ANPR) cameras and Mobile Enforcement Vehicles will be utilised as the basis of enforcement.

4.73 The strategy aims to be financially affordable, minimise unnecessary costs where possible and be flexible, so that equipment can be adapted to meet the evolving needs of the scheme or for different purposes as needs change over time. In the first instance synergies with the Public Space CCTV network upgrade, which is part of Smart Cities Scotland is being explored.

4.74 The enforcement system design will complement other strategic placemaking objectives such as the need to limit street clutter and minimising the impact on the heritage environment.

4.75 Simplification of the scheme in terms of the grace period and vehicle types included has the added benefit of clear and concise public communication about the Scheme going forward, which is also key to successful enforcement.

4.76 Funding being made available in the current financial year by Transport Scotland will be capitalised to further develop the enforcement system plans.

4.77 A copy of the Council's draft Local Enforcement Strategy is included in Appendix 7.

Monitoring

4.78 A LEZ annual progress report is required by the Regulations, on the operation and effectiveness of the scheme. The annual report is required to evaluate the Scheme's contribution towards improving air quality and reducing greenhouse gas emissions.

4.79 In addition to the statutory requirements for reporting, the Council will also seek to analyse the impacts of the Scheme on vehicle demographics (emissions standard profiles) and contribution towards modal shift, where possible.

4.80 In order to measure the objectives of the Scheme;

4.80.1 The monitoring of air quality will continue, and future consideration will be given to new requirements as SEPA's modelling work continues.

4.80.2 The Network Management strategy monitoring will involve public transport journey time analysis, traffic surveys and monitoring public feedback.

4.80.3 Transport-related emission reduction in respect to greenhouse gases will also be measured with the Council's commitment to target net-zero by 2030.

4.80.4 While working with Transport Scotland and the Energy Savings Trust, the Council will continue to monitor the uptake of LEZ Support Funds and other related retrofit funds.

4.81 The success of the Scheme will also be measured against the ability ensure integration of the LEZ with Edinburgh City Centre Transformation projects, the City Mobility Plan and the Local Air Quality Management statutory regime.

5. Next Steps

5.1 A period of statutory engagement and consultation will commence following the Committee meeting to make stakeholders and the public aware of the detail of the Preferred LEZ Scheme and to obtain views on the proposal. The engagement will run for 12 weeks and, in accordance with provisions set out in the Transport (Scotland) 2019 Act, will include consultation with:

5.1.1 SEPA

5.1.2 SNH

5.1.3 HES

5.1.4 Representatives of

- Road haulage industry
- Bus and coach industry
- Taxi and private hire car industry
- Local businesses
- Drivers likely to be affected by the proposal

5.1.5 Neighbouring local authorities

5.1.5.1 SEStran

5.1.5.2 NHS Lothian

5.2 LEZ regulations state that consultees must be provided with specific information on the Scheme, including details of the Scheme itself (the zone, date it comes into effect, the vehicles affected, objectives and grace periods), as well as the reasons for the Scheme and the time period for representations to be made and how representations should be submitted.

5.3 Although the minimum standard for buses is Euro VI, engagement with the bus sector will also take account of the way Lothian Buses are trialling the use of electric buses to explore if there are learning opportunities for other operators, with this developing technology.

5.4 Following the summer consultation, responses will be analysed and in the autumn the Committee will be asked to consider whether to approve the proposal. , or whether further work needs to be done by way of consultation. In the event that the

Committee approves the proposal, or does so subject to minor revision, the Final Scheme can be published prior to the end of the year.

5.5 A statutory period of a minimum 28 days will be initiated following publication of the Final Scheme. During this period formal objections to the proposal can be lodged.

5.6 In early 2022, the Committee will need to consider any objections and whether they are well founded and should be accommodated in the Final Scheme. At this stage an examination by the local authority can also be triggered.

5.7 Following the formal objections period, the Scheme would need to be submitted to Scottish Ministers for approval. Ministers also have the right to consider an examination.

5.8 An examination at either stage of the process would mean that the national indicative timeline to have a LEZ Scheme implemented in Spring 2022 could not be met.

5.9 If the scheme is modified to any significant extent following the statutory consultation or formal objections stages, there may be a need to restart the LEZ process, with statutory consultation afresh etc. Again, in this instance, the national timelines would not be met.

6 Financial impact

6.1 Introducing a LEZ in Edinburgh will be progressed alongside the development of the local transport strategy (City Mobility Plan) and Edinburgh City Centre Transformation. Together these projects represent a significant and positive investment in the City during a period of rapid population expansion with a key focus on prioritising sustainable choices and reducing the need for private car use.

6.2 The Scottish Government has allocated a multi-year budget to support the implementation of LEZ schemes across Scotland with funding released to each of the four local authorities at key stages of delivery. The Council was recently successful in securing £145,000 in grant funding from Transport Scotland to support costs relating to LEZ development, for example, traffic modelling and communication and engagement.

6.3 Subject to Committee approving the Preferred Scheme as detailed in this report, and subject to final consultation and engagement, detailed designs and implementation proposals for the project will be progressed which will set out final costs for the project, including future management and maintenance of the scheme. A further grant application will be made to Transport Scotland seeking funding towards the capital costs of implementing the project including cameras, technological support and signage.

6.4 Committee should note that Transport Scotland funding will not cover all aspects of implementing the LEZ project such as staffing costs, legal advice and potentially interventions to redesign any key road junctions.

6.5 Ongoing operational costs and maintenance of equipment will also not be covered by future grant support from Transport Scotland. This will have budgetary implications for the Council, which could be offset by revenue collected from penalty charges; however, revenue is likely to be limited due to the deterrent nature of the Scheme.

6.6 Indicative, high-level costs were taken into account for the appraisal process. The estimated future operational cost for the Preferred scheme is £400k per annum.

6.7 A full financial appraisal of the project will be undertaken once detailed designs and implementation costs have been established and will be reported to Committee later this year. The report will also detail costs which will be eligible for grant support from Transport Scotland and costs to be met by the Council.

7 Stakeholder/Community Impact

Consultation and Engagement on Preferred Scheme

7.1 A summary of an Integrated Impact Assessment (IIA) was presented to Committee in 2019 to understand the potential impacts of the LEZ. The process was supported by consultation with a range of stakeholders including representatives from protected characteristic groups, the taxi and private hire car sectors, the bus and coach sector, freight sectors through the Council's ECO Stars scheme and local businesses, as well as with wider general stakeholder groups, including health and environmental groups, schools, community councils and residents.

7.2 The Leadership Group involving representatives from Transport Scotland the other Scottish cities introducing a LEZ, helped to maintain a regional and national perspective on developing regulations, communication and impact assessment work. A 'Get Ready – LEZs are coming' national campaign was also supported by the Council.

7.3 In 2020/21 the IIA summary was supplemented by detailed impact assessment and fleet analysis for the Edinburgh Travel to Work Area, to create and updated IIA which is fit for purpose. This process also involved further discussion with Edinburgh Access Panel and officers working on the Council's Poverty Action Plan.

7.4 The IIA work and wider consultation has informed the detail of the Preferred Scheme and mitigation measures which will reduce impacts. The summer consultation will provide further opportunity for the public and stakeholders to engage with the Council ahead of the Scheme being finalised.

7.5 Strategic Environmental Assessment screening in 2019 highlighted the need for the LEZ to be assessed as a part of the wider Edinburgh City Centre Transformation programme and City Mobility Plan work. The SEA concluded that the cumulative impacts of introducing the LEZ along with other policies and strategies, such as the City Mobility Plan and Edinburgh City Centre Transformation, would generally be positive.

7.6 An area of concern highlighted in the SEA was the potential for negative impacts on air quality as a result of traffic displacement due to implementation of policies such as the LEZ. This was also considered in the formulation of the Preferred Scheme through the NMF.

7.7 Low Emission Zone Support Funds, to help those most in need to prepare for LEZ are provided by Transport Scotland. Certain affected groups as identified in the Integrated Impact Assessment (IIA) (e.g. low-income households, microbusinesses) are supported by the grant funding. Several other grants and loans are available for the wider population to support the switch to cleaner vehicles and are outlined in the IIA.

7.8 The initial IIA was reported to Committee in October 2019. The current IIA which has been updated is set out in Appendix 8. The Assessment will remain an interim report until such times as the Final Scheme is confirmed.

7.9 The City Mobility Plan SEA incorporating the LEZ is set out here.

8 Background reading/external references

5.0 National Low Emission Framework https://www.gov.scot/publications/national-low-emission-framework/pages/2/

5.1 SEPA 2018 – Initial NMF Report Low emission zone scheme – The City of Edinburgh Council

5.2 Low Emission Zone Scotland website Low Emission Zones Scotland | Transport Scotland

5.3 Energy Savings Trust – Support Funds Low Emission Zone Support Fund for households - Energy Saving Trust and Low Emission Zone Support Fund for businesses - Energy Saving Trust

9 Appendices

5.4 Appendix 1 – SEPA (2021) Air Modelling Results Interim

5.5 Appendix 2 – SEPA (2021) Emissions Analysis Report

5.6 Appendix 3 – Options Appraisal Document

5.7 Appendix 4 – Summary of Preferred LEZ Scheme Details

5.8 Appendix 5 – Jacobs (2021) Traffic Modelling Report

5.9 Appendix 6 – Post COVID19 Uncertainty Summary Note

5.10 Appendix 7 – Local Enforcement Strategy

5.11 Appendix 8 – Integrated Impact Assessment

SEPA Air Modelling Results - Interim Presentation Summary

Main Points to Note

- Both Large and Small LEZ options will improve air quality in the city centre (compared to 'No LEZ', there will be 75% fewer model exceedance points) and, to a lesser extent, the whole city (compared to 'No LEZ', there will be 50% fewer model exceedance points)
- For the Large and Small LEZ options, around 10% of modelled points that are 'In and Within 500m of the Large LEZ' have increased concentrations, when compared to the Base Run/Do Nothing scenario. They are, however, in different locations, have different magnitudes and last for different periods of time.
- The Large LEZ option will improve air quality over a larger area of the city centre than the Small LEZ, however will likely significantly increase concentrations and create new model exceedances on Palmerston Place and Chester Street. The 'future scenario' suggests these new model exceedances will not last long
- The Small LEZ option will not result in new model exceedances, however, the existing model exceedances on Lothian Road are still present in the 'future scenario' and will take longer to resolve.
- The introduction of a city centre LEZ does not significantly change predicted concentrations for AQMA's away from the city centre (e.g. Leith, Corstorphine) due to displaced traffic. No new exceedances are predicted in these areas, and air quality will improve as new vehicles enter the fleet and emissions are reduced over time.

Introduction and Background

Air quality monitoring and management activities in Scotland is primarily driven by the 2008 ambient air quality directive (2008/50/EC), which was incorporated into Scottish law through the Air Quality Standards (Scotland) Regulations 2010. At a local level, The Environment Act 1995 and Regulatory Reform (Scotland) Act 2014 sets out the Local Air Quality Management (LAQM) regime to assist Local Authorities in achieving air quality standards and objectives to protect human health.

The Cleaner Air for Scotland (CAFS) strategy, released in 2015, sets out how Scottish Government and its partner organisations propose to further reduce air pollution to protect human health and fulfil Scotland's legal responsibilities as soon as possible. The strategy includes commitments to ensure a consistent approach to the appraisal, design and implementation of Low Emission Zones (LEZ) through the application of the National Low Emission Framework (NLEF), in conjunction with the National Modelling Framework (NMF)

In September 2017, the Scottish Government's Programme for Government committed to the introduction of LEZ's in Scotland's four biggest cities (Glasgow, Edinburgh, Aberdeen and Dundee) by 2020, with the first introduced in Glasgow in 2018. COVID-19 and the subsequent lock-down restrictions have temporarily paused the implementation of LEZ's and the Scottish Government have set a new timetable for LEZs to be introduced across all four cities between February and May 2022.

CAFS is currently under review, with an updated strategy (CAFS2) expected later in 2021. The initial findings of the review identified that Scotland was performing well on air quality, with the major pollutants continuing to

fall as a result of actions taken to date. However, the review also recommended that Scotland must take a precautionary public health approach to air quality reductions.

The modelling presented here has been carried out in line with the NMF, which has the aim to deliver a detailed and consistent approach to urban air quality modelling. The methodology was developed during a pilot project in Aberdeen and was reviewed by Professor Margaret Bell of Newcastle University.

The NMF methodology is based on using high quality and detailed traffic data to calculate vehicle emissions, appropriate meteorology and background concentration data. Models are built using the same software (ADMS Urban for dispersion modelling and EMIT for emissions calculations); consistent methods and model settings are used, where appropriate. Street geometry data (e.g. road layout, road width and building heights) are derived from the same sources. The results of the modelling are processed, visualised and reported in a consistent and informative way.

An earlier report (Air Quality Evidence Report – Edinburgh; November 2018) shows that the NMF Edinburgh model performs well when compared against observed air quality data, highlights how fleet composition changes can improve air quality on a city wide basis and looks at source apportionment for different vehicle sectors.

This report considers how changes to traffic due to the introduction of a city centre LEZ can affect air quality and accompanies a presentation provided to Edinburgh Council. It is important to note that this is an interim report due to technical issues; any uncertainties due to these technical issues are highlighted.

Low Emission Zone options:

Within this document, the LEZ options are referred to as the 'Large LEZ' and 'Small LEZ':

- **Large LEZ:** This is the LEZ option which includes Morrison Street, Torphichen Street, Palmerston Place and Chester Street as the Western boundary (Fig 1)

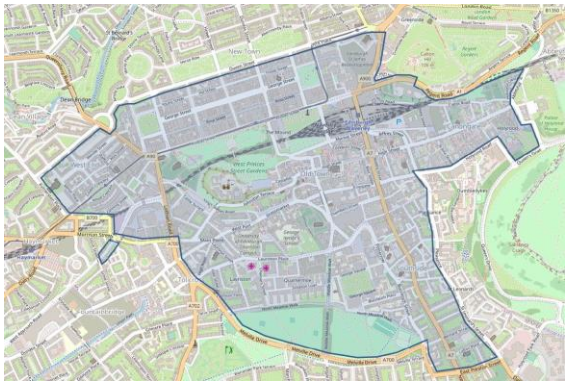


Fig 1: Large Low Emission Zone option

- **Small LEZ:** This LEZ option has Lothian Road and Charlotte Square as the western boundary (Fig 2)

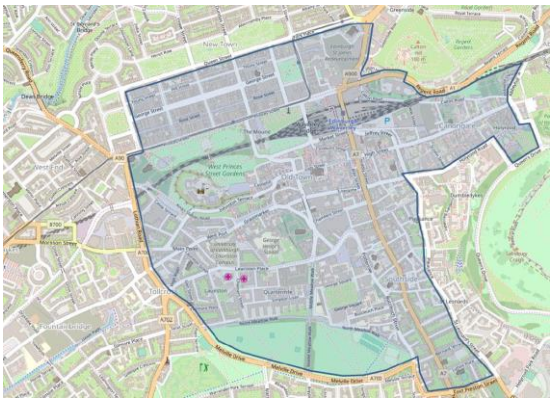


Fig 2: Large Low Emission Zone option

Traffic Modelling:

The traffic modelling was carried out by Jacobs, with results in a report issued on 22nd February 2021

Assumptions:

The results presented here assume all Taxis and Buses are compliant across the whole city. Emissions are calculated from 24 hour annual average flows

Model Exceedances and Air Quality Standards:

This report refers to 'model exceedances' which is the predicted concentration at kerbside points. This differs from the legal Air Quality Standards exceedances which refers to concentrations at relevant receptors. The Nitrogen Dioxide (NO_2) 40 micrograms per metre cubed ($\mu g/m^3$) threshold is used for both.

Air Quality Concentrations compared to 2019 Base Scenario

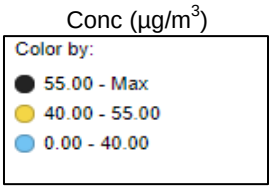
NO_2 Concentration Predictions

- An ANPR survey in 2019 has provided comprehensive data on the vehicle fleet composition (% of vehicle classes with a specific Euro class, and hence the % of each vehicle class which are compliant with LEZ rules)
- The air quality model was run for 3 scenarios:
    - No LEZ or 'do nothing' approach
    - Large LEZ
    - Small LEZ
- Traffic flow data used in air modelling is derived from the 2016 traffic survey (this is so consistency with traffic modelling has been maintained). The LEZ air quality modelling uses traffic flow and compliance predictions from traffic modelling work carried out by Jacobs. More information on Traffic Modelling can be found in the report by Jacobs
- Figures 1, 2 and 3 show predicted concentrations from each of the model scenarios. Kerbside points coloured yellow represent NO_2 concentrations between 40 and 55 µg/m^3. Black points are NO_2 concentrations greater than 55 µg/m^3 (Note that kerbside points are located ~50m apart along kerbs of roads in the model and the model provides predicted concentrations at each of these points)

Fig 3: Base Run (2019 ANPR) conc's

Fig 4: Large LEZ (2019 ANPR) conc's

Fig 5: Small LEZ (2019 ANPR) conc's



- Figures 3-5 and Table 1 show both LEZ options show clear improvements to Air Quality across the city (24% of kerbside points across the city exceed 40 µg/m^3 in the Base Run and this is reduced to 12% of kerbside points across the city that exceed 40 µg/m^3 if the Large or Small LEZ option is implemented).

- If only the points within the Large of Small LEZ areas are considered, the percentage of kerbside points exceeding 40 µg/m^3 is significantly reduced (43% to 8-12%) if either LEZ option is implemented.
- The **Large LEZ** (Fig 4) shows new model exceedances are predicted in Chester Street/Palmerston Place. This is likely due to increased traffic flows in these streets which is made up of non-compliant (higher emitting) vehicles which are avoiding the LEZ
- The **Small LEZ** (Fig 5) has lower NO_2 concentrations in the West End compared to the Base Run and Large LEZ option, however model exceedances are still predicted on Queen Street and Lothian Road. (Compared to the Large LEZ, the small LEZ would result in higher concentrations on these roads)

Table 1: Summary of Percentage of Model Exceedances

Percentage of Kerbside Points exceeding 40µg/m^3	Model Scenarios		
	Base Run	Large LEZ	Small LEZ
All City	24%	12%	12%
In Large LEZ area	43%	10%	12%
In Small LEZ area	43%	8%	9%

Predicted NO_2 Concentration Increases (when compared to 2019 Base Run)

- NO_2 concentration increases, when compared to Base Run, are shown in Figure 6 (these are just increases and may not necessarily be model exceedances)
- Location of particular interest is Palmerston Place/Chester Street where concentrations increase by around 9-12 µg/m^3
- Other locations where concentrations increase (Southside/Holyrood/Moray Feu/Grove Street/Gardiner Crescent) are expected to be small (Note that modelling uncertainties may be larger than these small increases and can be considered to be insignificant)

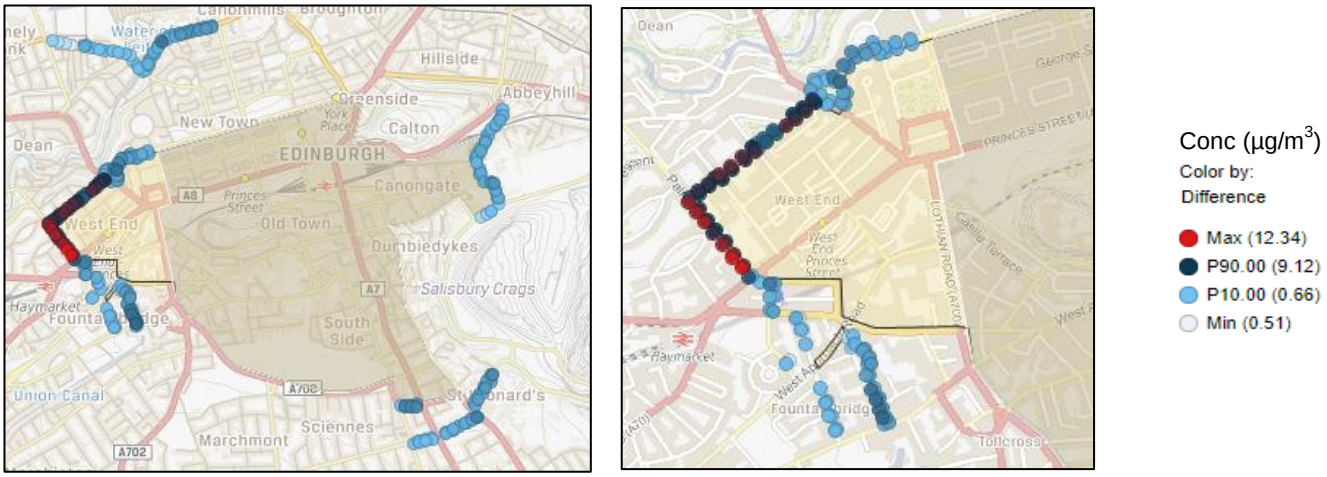


Fig 6: Increases in NO_2 concentrations for Large LEZ compared to 2019 Base Run (right image is close up of West End)

- Figure 7 shows locations where predicted NO_2 increases for the Small LEZ, when compared to the Base Run. The largest increases are expected on the Southside (West Preston Street, Salisbury Road and Holyrood Park Road), which are around 1-4 µg/m^3.
- Absolute NO_2 concentration increases for the Small LEZ are not as significant as the increase resulting from the Large LEZ. The majority (~90%) of increases are less than 1 µg/m^3.

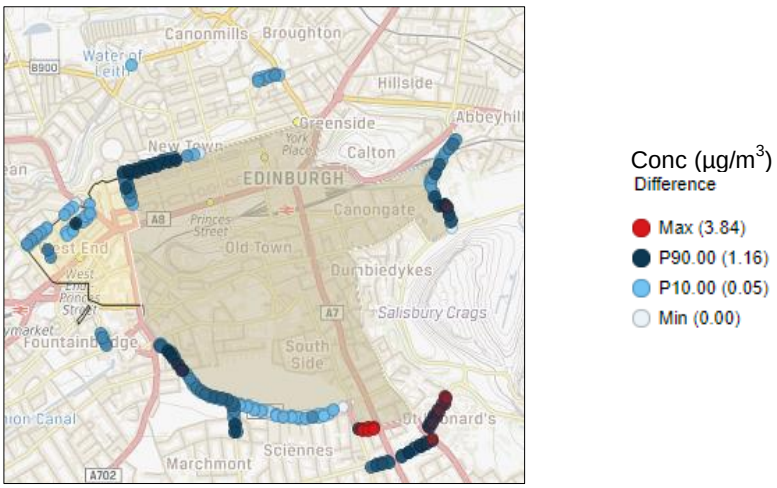


Fig 7: Increases in NO_2 concentrations for Small LEZ compared to 2019 Base Run

- For each LEZ case, ~10% of kerbside points that are 'in and within 500m of the Large LEZ' have increased concentrations, when compared to the Base Run. They are, however, in different locations and of different magnitudes

Predicted NO_2 Concentration Increases which lead to New Model Exceedances (compared to 2019 Base Run)

- New model exceedances are predicted on Chester Street and Palmerston Place (Fig 8) for the Large LEZ at kerbside points where concentrations have increased up to 11 µg/m^3 compared to the Base Run. Unfortunately, for technical reasons, actual concentrations are unknown, although Fig 4 shows they are between 40 and 55 µg/m^3. **Note**: this is a slightly lower increase than reported in Fig 6 as points with larger concentration increases may be a model exceedance point in the Base Run.
- Some new model exceedance points are predicted on Abbeyhill, however the absolute concentration increases are small (~0.3 µg/m^3), and model uncertainties are likely to be larger than this

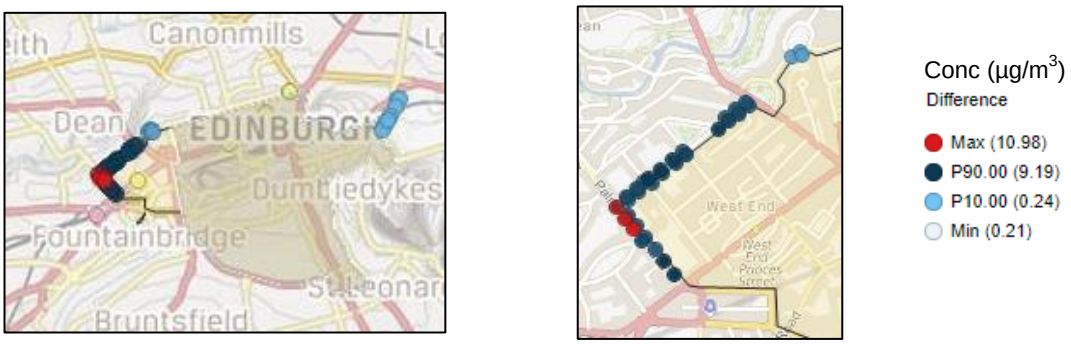


Fig 8: Increases in NO_2 concentrations and new model exceedances for Large LEZ compared to 2019 Base Run

- Predictions for the small LEZ show 3 points where new model exceedances may occur (Fig 9), however it is important to note that predicted increases are small (~0.8µg/m^3) and model uncertainties are likely to be larger than this. There is also no significant cluster of points, unlike the Large LEZ option, so the there is a low risk of creating areas with new model exceedances.

Fig 9: Increases in NO_2 concentrations and new model exceedances for Small LEZ compared to 2019 Base Run

The 2 LEZ options - what are the Trade-off's?

This section looks at the impact of selecting one LEZ area in preference to another. This modelling is based on 2019 fleet compositions

1. If Large LEZ is chosen in preference to the Small LEZ

- This section shows the predicted impacts if a Large LEZ is chosen in preference to the Small LEZ

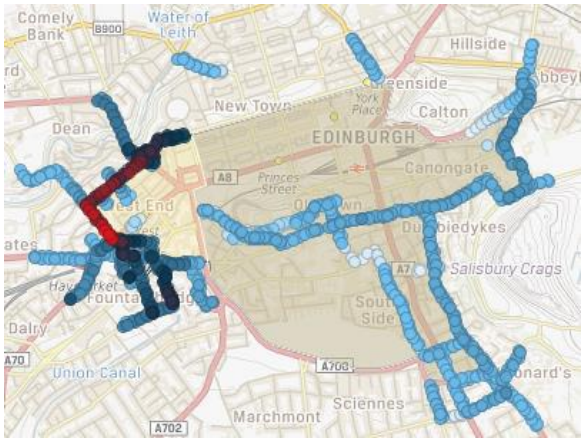


Fig 10: Points where higher NO_2 concentrations would occur

Fig 11: Points where higher NO2 concentrations and predicted model exceedances would occur

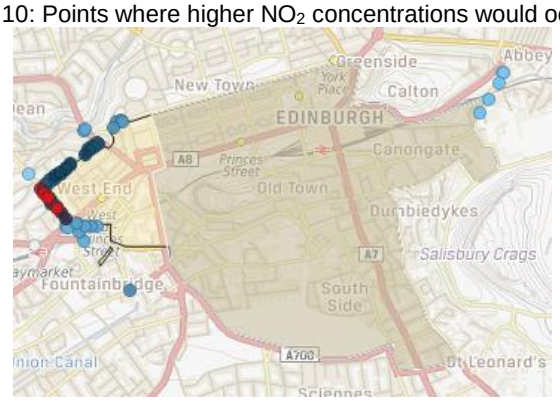
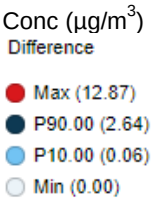


Fig 12: Points where higher NO2 concentrations and predicted model exceedances which wouldn't exist in the Small LEZ option had been selected



- Figure 10 shows points where higher NO_2 concentrations would occur than if the Large LEZ had been selected in preference to the Small LEZ.
- Higher concentrations are found on some roads within the Large LEZ and roads leading to the LEZ. These account for 41% of kerbside points 'In and Within 500m' of the Large LEZ area.
- Significantly higher concentrations are predicted on the western boundary of the Large LEZ (up to ~13 µg/m^3 higher), when compared to the Small LEZ. However, most other kerbside points have small differences in concentrations compared to the Small LEZ option
- Some kerbside points where predicted NO_2 concentrations are higher when compared to the Small LEZ, are also predicted to be model exceedances. This accounts for 7% of kerbside points 'In and Within 500m' of the Large LEZ area.
- Significantly increased concentrations are predicted along Palmerston Place and Chester Street which lead to model exceedances which would not exist with Small LEZ (Fig 12). This is likely to be due to increased traffic flows of traffic which is dominated by non-compliant traffic (avoiding LEZ).
- Model exceedances are also predicted along Cowgate and Abbeyhill, however, concentrations are only slightly higher than Small LEZ option (Fig 11)

2. If Small LEZ is chosen in preference to the Large LEZ

- This section shows the predicted impacts if a Small LEZ is chosen in preference to the Large LEZ

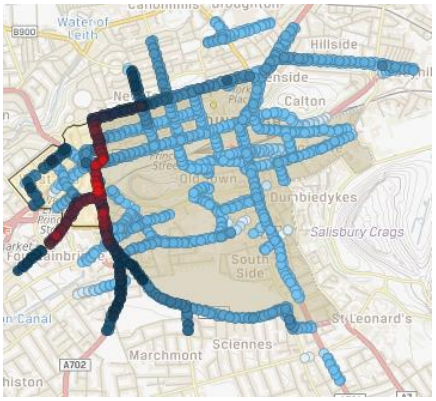


Fig 13: Points where higher NO2 concentrations would occur

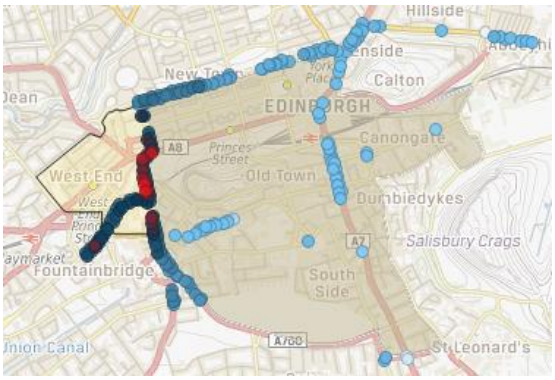


Fig 14: Points where higher NO2 concentrations and predicted model exceedances would occur

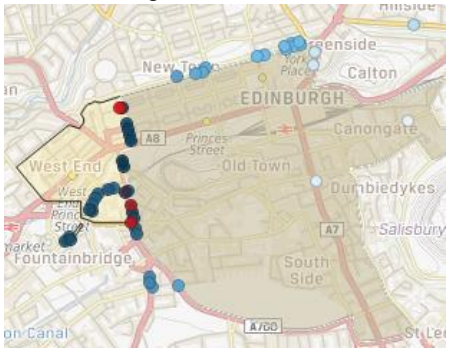


Fig 15: Points where higher NO2 concentrations and predicted model exceedances which wouldn't exist if the Large LEZ option had been selected

- Figure 13 shows points where higher NO_2 concentrations would occur than if the Small LEZ had been selected.
- Higher concentrations are found on some roads within the Large LEZ and roads leading to the LEZ. These account for 59% of points 'In and Within 500m' of the Large LEZ area.
- Significantly higher concentrations are predicted on the western boundary of the Small LEZ (up to ~12 µg/m^3 higher), when compared to the Large LEZ. However, most other points have small differences in concentrations compared to the Large LEZ option
- Some points with higher NO_2 concentrations compared to the Large LEZ are also model exceedances. This accounts for 10% of points 'In and Within 500m' of the Large LEZ area.
- Significantly increased concentrations are predicted along Charlotte Square/Lothian Road/Earl Grey Street/West Approach Road which lead to model exceedances that would not exist with Large LEZ (Fig 15). This is likely to be due all traffic being allowed to travel along Lothian Road as it is not in the LEZ. It is important to note that when compared to the 2019 Base run (Fig 5), there is only a very small improvement in concentrations along these streets.
- Continued model exceedances are predicted along West Port/South Bridge/Leith Street (Fig 5 and Fig 14), although concentrations are only slightly higher than Large LEZ option

Summary of comparison between LEZ scenario options (2019 fleet)

Table 2: Summary table comparing the selection of one LEZ option over the other. The percentage refers to number of Kerbside points 'In and Within 500m of the Large LEZ. Kerbside points are located ~50m along the kerb of each road in the model

Kerbside Points In and Within 500m of Large LEZ area	Increased Concentrations (when compared to alternative LEZ)	Increased Concentrations and predicted model exceedances (when compared to alternative LEZ)	Increased Concentrations and predicted model exceedances (which would not exist in other LEZ scenario)
Large LEZ chosen over Small LEZ	41%	7%	3%
Small LEZ chosen over Large LEZ	59%	10%	2%

- Both LEZ options may result in model exceedances which may not exist if the alternative LEZ option had been selected
- Selecting the Small LEZ may lead to higher concentrations and number of model exceedances at more points across the area 'In and Within 500m of the Large LEZ' (10%) than the Large LEZ (7%)
- The selection of the Large LEZ may lead to more model exceedances which would not exist in the Small LEZ option (3%), than if the Small LEZ was selected in preference to the Large LEZ (2%).

Future Years Modelling

Base Model

- The traffic model and air quality model was run for 2023 predicted fleet composition. It is important to note that predicted fleet compositions are uncertain and in reality this represents a 'future scenario' which is likely to be post-2023.
- The 'do nothing' future scenario shows that, although air quality is expected to improve, model exceedances are still predicted (Fig 16 and Table 3)

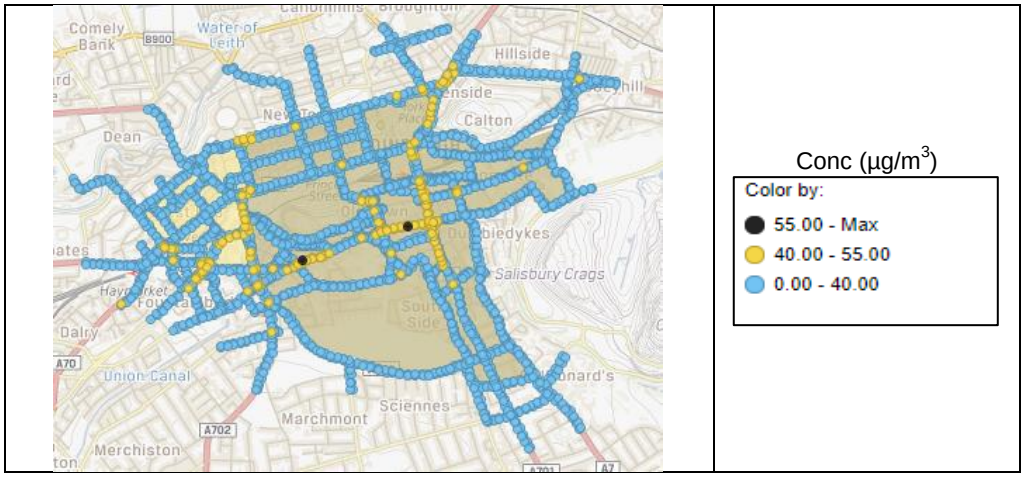


Fig 16: Base, or 'do nothing', future scenario

Table 3: Comparison of 2019 (ANPR) and 2023 ('Future scenario')

Percentage of Points exceeding 40µg/m^3	Scenarios	
	2019 ANPR	**Future scenario ('2023')**
All City	24%	3%
In Large LEZ area	43%	11%
In Small LEZ area	43%	11%

Long Term Trade-Off's when selecting the Small or Large LEZ

Large LEZ selected

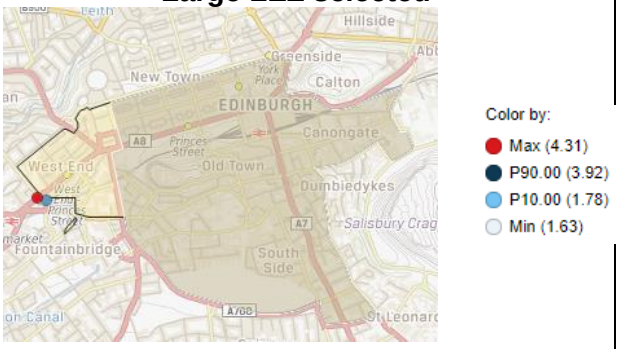


Fig 17: Model exceedances which would not exist if the Small LEZ had been selected

Small LEZ selected

Fig 18: Model exceedances which would not exist if the Large LEZ had been selected

- Model predictions suggest that if the Large LEZ was selected in preference to the Small LEZ (Fig 17), the model exceedances on Chester Street/Palmerston Place would disappear for a 'future fleet' (as described earlier, the 2023 predicted fleet is used, though this is optimistic).
- As 2019 modelling shows no model exceedances on these roads when the Small LEZ is selected (Fig 5), and assuming that no model exceedances on these roads will exist in any post 2019 scenario for the Small LEZ option, then if there were to be any model exceedances on Chester Street/Palmerston Place, these would show up in Fig 17. This is likely to be due to more compliant vehicles on the road returning and fewer vehicles avoiding the LEZ.
- However, if the Small LEZ was selected (Fig 18), there would be a cluster of model exceedance points on Lothian Road/Princes Street which would not be seen if the Large LEZ had been selected. Both 2019 LEZ modelling scenario shows model exceedances on these streets (Figs 4 and 5), so this suggests these points would not be model exceedances in 'future years' if the Large LEZ had been selected. Therefore model exceedances may last for a longer into the future if the Small LEZ is selected. Although, traffic emissions will be lower in future years, on these streets non-compliant traffic is able to use the Lothian Road/Charlotte square corridor.
- Notes:
    - Modelling future years is uncertain, as the Department for Transport fleet composition predictions tend to be optimistic.
    - There is a minor error in 2023 LEZ modelling as an incorrect taxi fleet composition was used and emissions were therefore underestimated
    - Unfortunately, plots which show all model exceedances for the 'future scenario' are not available.

Emissions Analysis for Low Emission Zones - Edinburgh

May 2021

Main Points to Note

- Introducing a Low Emission Zone (LEZ) within Edinburgh City Centre will reduce NO_x emissions from traffic sources, within either LEZ option, by 55% (equivalent to 25-30 tonnes/year), when compared to 2019 levels.
- For areas that are not in the LEZ, it is predicted that NO_x emissions from traffic sources will decline by 15%, when compared to 2019 levels.
- Overall, NO_x emissions across the model domain will decline by 20% (or 72 tonnes/year), when compared to 2019 levels.
- On several roads within the LEZ, NO_x emissions are predicted to decline by over 50%. On Princes Street NO_x emissions are predicted to decline by over 75%.
- The LEZ will force some non-complaint traffic to re-route around the LEZ boundary, increasing emissions on some of these roads by over 50%, when compared to 2019 levels.
- It is predicted that selecting the Large LEZ option would increase NO_x emissions on Palmerston Place and Chester Street by 85% (compared to 2019 levels), which would generate new exceedances at kerbsides and may result in new exceedances of Air Quality Standards at receptors. However, these new exceedances may be short lived as the 'future' scenario predicts that as new LEZ compliant vehicles enter the fleet, fewer vehicles will be required to re-route, resulting in NO_x emissions falling below 2019 levels. The large emission increases are a worst-case scenario, as the scheme will not be fully implemented and enforced until 2024, any emission increases will be lower than this. Further detailed air quality modelling work will be undertaken to assess potential compliance levels.
- Selecting the Small LEZ is unlikely to create new exceedances at kerbsides, though it is likely to slow down air quality improvements in the West End zone (between Lothian Road, Torphichen Street, Palmerston Place and Chester Street), and it may take longer to achieve compliance in these areas.

Introduction and Background

Air quality monitoring and management activities in Scotland is primarily driven by the 2008 ambient air quality directive (2008/50/EC), which was incorporated into Scottish law through the Air Quality Standards (Scotland) Regulations 2010. At a local level, The Environment Act 1995 and Regulatory Reform (Scotland) Act 2014 sets out the Local Air Quality Management (LAQM) regime to assist Local Authorities in achieving air quality standards and objectives to protect human health.

The Cleaner Air for Scotland (CAFS) strategy, released in 2015, sets out how Scottish Government and its partner organisations propose to further reduce air pollution to protect human health and fulfil Scotland's legal responsibilities as soon as possible. The strategy includes commitments to ensure a consistent approach to the appraisal, design and implementation of Low Emission Zones (LEZ) through the application of the National Low Emission Framework (NLEF), in conjunction with the National Modelling Framework (NMF).

In September 2017, the Scottish Government's Programme for Government committed to the introduction of Low Emission Zones in Scotland's four biggest cities (Glasgow, Edinburgh, Aberdeen and Dundee) by 2020, with the first introduced in Glasgow in 2018. COVID-19 and the subsequent lock-down restrictions have temporarily paused the implementation of LEZ's and the Scottish Government have set a new timetable for LEZs to be introduced across all four cities between February and May 2022.

CAFS is currently under review, with an updated strategy (CAFS2) expected later in 2021. The initial findings of the review identified that Scotland was performing well on Air Quality, with the major pollutants continuing to fall as a result of actions taken to date. However, the review also recommended that Scotland must take a precautionary public health approach to air quality reductions.

The analysis presented here has been carried out in line with the NMF, which has the aim to deliver a detailed and consistent approach to urban air quality modelling. The methodology was developed during a pilot project in Aberdeen and has been peer reviewed.

The NMF methodology is based on using high quality and detailed traffic data to calculate vehicle emissions, appropriate meteorology and background concentration data. Models are built using the same software (ADMS Urban for dispersion modelling and EMIT for emissions calculations); consistent methods and model settings are used, where appropriate. Street geometry data (e.g. road layout, road width and building heights) are derived from the same sources. The results of the modelling are processed, visualised and reported in a consistent and informative way.

An earlier report (SEPA Air Quality Evidence Report – Edinburgh; November 2018) shows that the NMF Edinburgh model performs well when compared against observed air quality data, highlights how fleet composition changes can improve air quality on a city-wide basis and looks at source apportionment for different vehicle sectors.

An interim report (SEPA Air Modelling Results - Interim Presentation Summary) was issued by the Scottish Environment Protection Agency (SEPA) in April 2021 based on an interim data which was only available at that time due to the SEPA cyber-attack. This report focussed on how changes in traffic flow and fleet composition will change air quality concentrations due to the proposed introduction of both City Centre LEZ options.

SEPA Cyber Attack – and the Alternative Approach Taken

On Christmas Eve, SEPA was subject to a serious and complex criminal cyber-attack that significantly impacted our internal systems and our Air Quality modelling capabilities.

As part of our recovery plan, SEPA implemented a phased rollout programme to restore critical services, re-establish critical communication systems to continue providing our priority regulatory, monitoring, flood forecasting and warning services. Our priority regulatory work programme included the delivery of our NMF obligations to assist in the final assessments of the LEZ options for each city.

Due to SEPAs inability to carry out Air Quality modelling, an alternative approach to allow for local authorities to report to committee in Spring 2021 was discussed at the LEZ Leadership Group meeting held on the 3rd of February 2021. The following steps were recommended by Scottish Government and SEPA on a way forward:

- Continuation of traffic modelling to define a small number of potential LEZ options or a preferred LEZ option for each city.
- SEPA to carry out emissions analysis on the traffic model outputs using the established NMF methodology. This will assess the impact of the LEZ by comparing traffic and emissions between the reference/base case and LEZ options.
- SEPA to continue detailed AQ modelling during the consultation phase over the summer of 2021 to support the local authorities in finalising the preferred LEZ scheme for Ministerial approval.

Low Emission Zone options:

Within this document, the LEZ options are referred to as the 'Large LEZ' and 'Small LEZ':

- **Large LEZ**: This is the LEZ option which includes Morrison Street, Torphichen Street, Palmerston Place and Chester Street as the Western boundary (Figure 1).

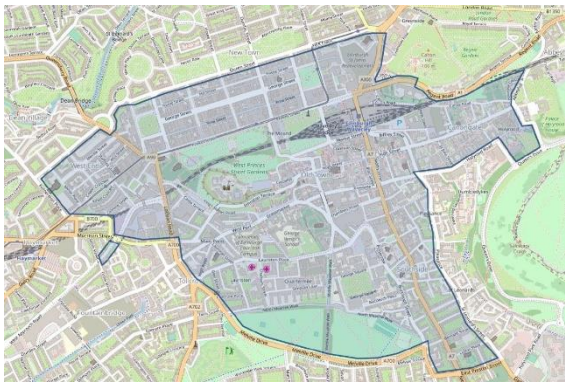


Figure 1: Large Low Emission Zone option

- **Small LEZ**: This LEZ option has Lothian Road and Charlotte Square as the western boundary (Figure 2).

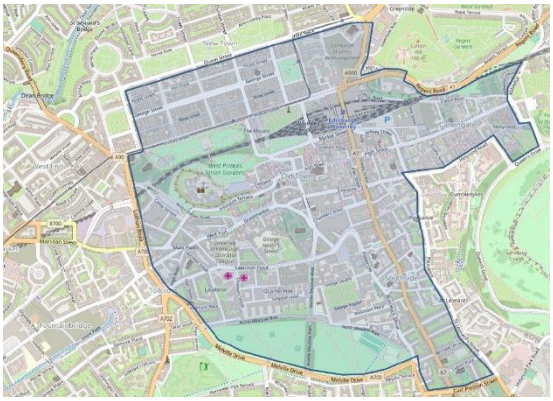


Figure 2: Small Low Emission Zone option

Traffic Modelling:

The LEZ traffic modelling predicts traffic flows numbers and the percentage of traffic which is compliant with LEZ rules for each road in the air quality model, by implementing an LEZ to force traffic to re-route according to the LEZ rules.

The traffic modelling, carried out by Jacobs (Edinburgh Low Emission Zone Transport Modelling Report, Jacobs, February 2021), has been run for a 2019 and a 2023 scenario. The 2019 scenario is based on ANPR data collected in Edinburgh. The 2023 scenario represents a plausible 'future' scenario that is likely to occur later than 2023.

The traffic models incorporate committed future City Centre Transformation (CCT) plans for the LEZ scenarios, such as closing Bank Street to general traffic.

Assumptions:

The analysis and results in this report assume all Taxis and Buses are LEZ compliant across the whole city. Emissions are calculated from 24-hour annual average flows.

Emission Calculations:

The EMIT software package, distributed by CERC, incorporates emission rates from the Emission Factor Toolkit, and has been used to calculate emission rates for NO_x and NO_2.

Emissions are calculated using fleet composition data (i.e. % of vehicles with a particular Euro Class), vehicle flow numbers and published emission factors. Emission rates (grams per kilometre per second or g/km/s) are used to compare emissions on each road, as this is a fair comparison between roads of different lengths.

NO_x and NO_2

Nitrogen Oxides (NO_x) is the sum of Nitrogen Dioxide (NO_2) and Nitrogen Oxide (NO). They chemically interact with each along with Ozone (O_3) and sunlight.

Vehicles directly emit both NO and NO_2 (known as primary NO and primary NO_2). When primary NO chemically reacts to for NO_2, this is known as secondary NO_2.

Due to this chemical interaction, there may not be a direct relationship between an increase in road traffic emissions and NO_2 concentrations. We also need to consider background concentrations, which are due to emissions from other (non-traffic) sources, and which make up a significant percentage of total NO_2 and NO_x concentrations.

Therefore, in this report we focus on total NO_x emissions from traffic sources.

Model Exceedances and Air Quality Standards:

This report refers to 'model exceedances' which are based on the predicted concentrations at kerbside points. This differs from the legal Air Quality Standards exceedances which refers to concentrations at relevant receptors. The Nitrogen Dioxide (NO_2) 40 micrograms per metre cubed ($\mu g/m^3$) threshold is used for both.

All NO_2 predictions used in the report are modelled and are from the detailed Edinburgh Air Quality model.

NO_x Emission Predictions (2019 Scenario)

- NO_x Emission rates for 2019 were calculated for 3 scenarios:
  - Base (No LEZ or 'do nothing' approach)
  - Large LEZ option
  - Small LEZ option
- An ANPR survey in 2019 provided comprehensive data on the vehicle fleet composition, which includes each vehicles Euro Class, so that compliance percentages can be calculated (Table 1). This is needed to calculate emission rates.

Table 1:LEZ Compliance (%) for each Vehicle Class (2019 Edinburgh Fleet from ANPR)

Vehicle Class	Compliant (%)	Non-compliant (%)
Car (Diesel)	42.6	57.4
Car (Petrol)	88.4	11.6
LGV	41.2	58.8
HGV	64.4	35.6

- Traffic flow data from the detailed Edinburgh 2016 traffic survey has been used (this is to maintain consistency with the Jacobs traffic model which uses this data).
- The Emission Rate colour scheme is:
  - Black: Highest emissions rates (> 0.15 g/km/s).
  - Red: Mid-level emission rates between 0.08 - 0.15 g/km/s.
  - Blue: Low emission rates (< 0.08 g/km/s).
- It is important to note that high emission rates do not necessarily correspond to high NO_2 concentrations, as this also depends on the dispersion characteristics for each road (e.g. buildings and street canyons).

All Roads in Model

- Base Scenario Emissions Rates are shown in Figure 3 and Figure 9. This shows roads with the highest emission rates are on Princes Street, Lothian Road, Bridges, Leith Street, London Road, Queensferry Road and St John's Road/Glasgow Road.

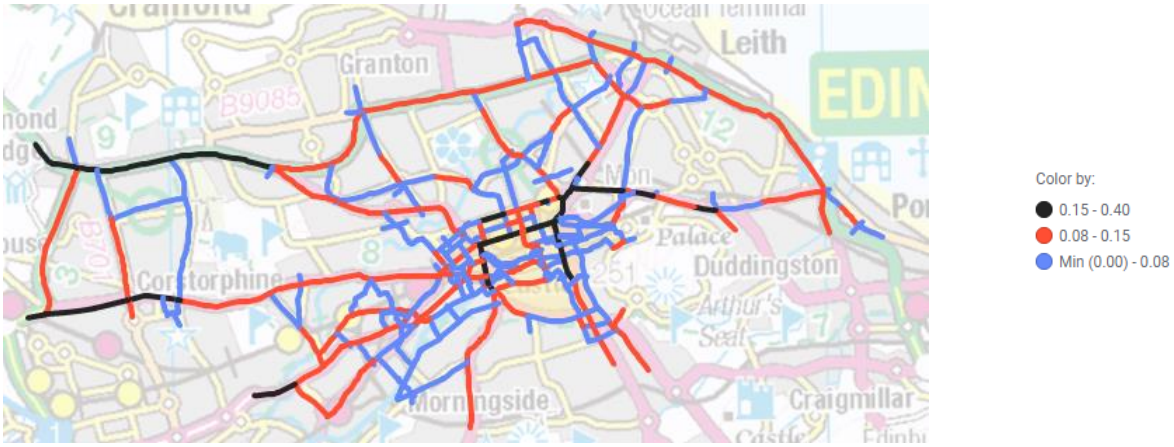


Figure 3: Base NO_x Emission Rates 2019 (g/km/s)

Figure 4: Large LEZ Option (with CCT) NO_x Emission Rates 2019 (g/km/s)

Figure 5: Small LEZ Option (with CCT) NO_x Emission Rates 2019 (g/km/s)

- A comparison of predicted emission rates across the whole city for both the Large LEZ option (Figure 4) and Small LEZ option (Figure 5) shows that emissions rates are predicted to decline for both LEZ options in many areas across the city.
- There are wider benefits to air quality across the city as a result of a City Centre LEZ (e.g. emission reductions in Corstorphine, Gorgie, Bruntsfield, Newington, London Road and Leith). This is due to all buses and taxis becoming compliant with LEZ rules over the whole city.
- Emission Rates can also be viewed on a histogram (Figure 6 - Figure 8), which shows the ranking of emission rates for each road section in the model. For both LEZ options, the number of roads coloured black (> 0.15 g/km/s) is significantly lower than the Base Scenario.
- The Large LEZ has a slightly fewer number of roads with a high emission rate (those coloured black).
- The magnitude of predicted emission rates generally declines over the whole city as a result of the introduction of both LEZ options, though there are some roads where emission rates increase (e.g. Large LEZ option: Palmerston Place and Chester Street).

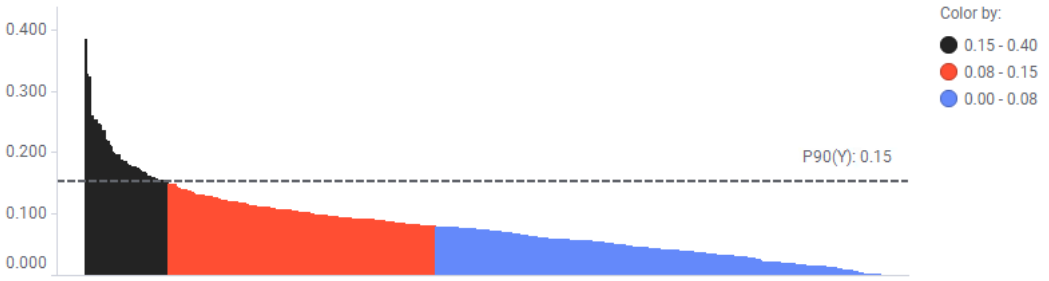


Figure 6: Base NO_x Emission Rates histogram 2019 (g/km/s)

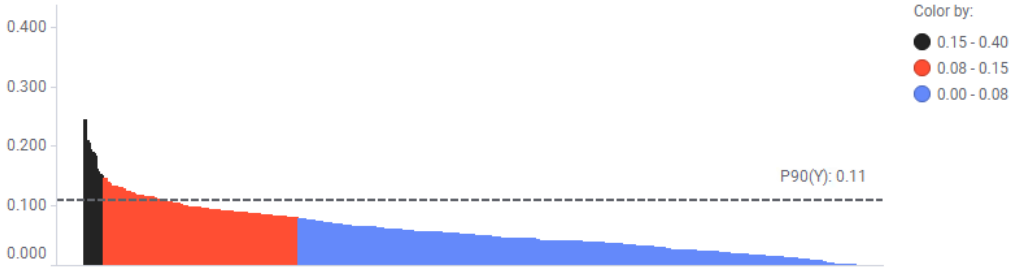


Figure 7: Large LEZ (with CCT) Option NO_x Emissions Rates histogram 2019 (g/km/s)

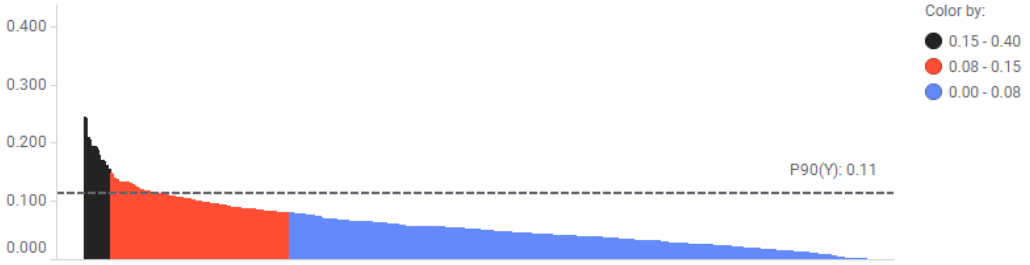


Figure 8: Small LEZ (with CCT) Option NOx Emission Rates histogram 2019 (g/km/s)

- Total NO_x emissions are predicted to decline by around 55% within the LEZ boundaries. For roads not in the LEZ, total NO_x emissions are predicted to decline by around 15%.
- In the West End Zone (this is the area which is within the Large LEZ, but not the Small LEZ), emission reductions would be:
    - Small LEZ option (LEZ rules do not apply): 32%
    - Large LEZ option (LEZ rules apply): 49%
    - This is the equivalent of 2 tonnes/year fewer NO_x emissions in the West End Zone if the Large LEZ option is selected in preference to the Small LEZ option.
- However, it is important to look at the area in and around the LEZ boundaries in more detail, where the Jacobs report indicates that there is traffic displacement due to the LEZ.

City Centre (around the proposed LEZ's)

- Emission rates in the city centre for the Base Run and both LEZ options are shown in more detail in Figure 9 - Figure 11.
- This shows that the introduction of Large or Small LEZ will significantly reduce NO_x emissions in the respective LEZ areas when compared to the Base scenario (Figure 9).
- Increased emissions rates are predicted on some roads around the LEZ boundary due to the displacement of traffic. This is particularly significant for the Large LEZ option on Chester Street and Palmerston Place.
- Roads where increased emissions rates are predicted to increase will be analysed in more detail later in this report.

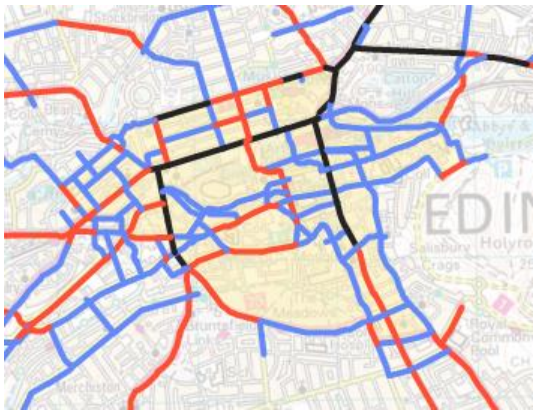


Figure 9: Base NO_x Emissions Rates 2019; g/km/s (Yellow Zone is Large LEZ)

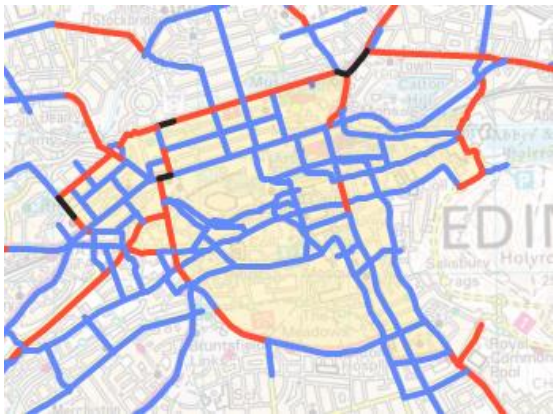
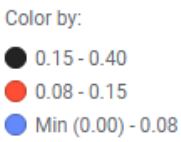


Figure 10: Large LEZ Option (with CCT) NO_x Emission Rates 2019 (g/km/s) (Yellow Zone is Large LEZ)

Figure 11: Small LEZ Option (with CCT) NO_x Emission Rates 2019 (g/km/s) (Yellow Zone is Small LEZ)



Emission Differences between Base and LEZ Options (2019)

Base v Large LEZ

- Ratios of emission differences between the Base and Large LEZ option are shown in Figure 12. This shows emissions declining within the Large LEZ area (except New Street and Walker Street where emission rates are low).
- NO_x emission rate reductions of over 50% are predicted on several roads (Princes Street, Leith Street and Bridges/Clerk Street). Emission rates on Princes Street are predicted to be over 75% lower than Base 2019 levels.
- NO_x emission rate increases are predicted on several roads around the Large LEZ boundary. The largest percentage increases (>50%) are Chester Street, Palmerston Place, Gardiner's Crescent and Grove Street.
- It is important to note that on some roads, while there may be a large percentage increase, the actual emission rate may remain low.

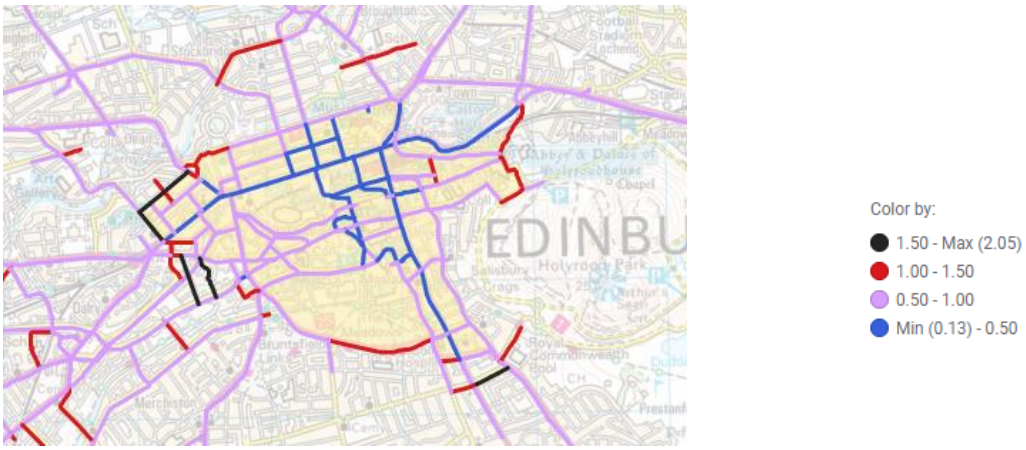


Figure 12: Ratio of NO_x Emission Rate changes (2019) due to introduction of Large LEZ. Black is largest % increase in emissions (> 50%)

Base v Small LEZ

- Ratios of emissions differences between the Base and Small LEZ option are shown in Figure 13. This shows emissions falling within the LEZ (except New Street and the east section of George Street).
- Like the Large LEZ, NO_x emission reductions of over 50% are predicted on several roads, including Princes Street, Leith Street and Bridges/Clerk Street. Emission rates on Princes Street are predicted to be over 75% lower than 2019 levels.
- Also like the Large LEZ, emission increases are predicted on several roads around the Small LEZ boundary. The largest percentage increases (43%) are on Salisbury Place, West Preston Street and Melville Street, however NO_x emission rates are and will remain low on these roads.

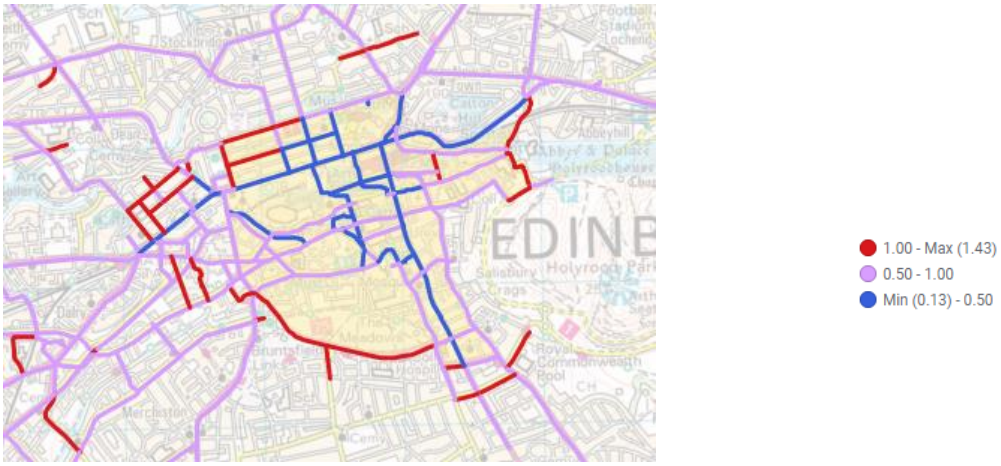


Figure 13: Ratio of NO_x Emission Rate changes (2019) due to introduction of Small LEZ. Red are roads where there is a % increase in emissions

NO_x Emission Predictions (2023 'future' Scenario)

- As for the 2019 scenario, NO_x emission rates for the 2023 'future' scenario were calculated for 3 options:
  - No LEZ or 'do nothing' approach
  - Large LEZ option
  - Small LEZ option
- Predicting future traffic fleet compositions is subject to many uncertainties. The predicted 2023 National Fleet composition (published by the Department for Transport (DfT)) has been used to represent a 'future' scenario for this analysis.
- It has been shown that the DfT National Fleet predictions tend to be optimistic, so it is likely that the published 2023 scenario will occur post-2023, therefore it is called a 'future' scenario. The compliance percentages in the published 2023 scenario are in Table 2. This is needed to calculate emission rates.

Table 2: LEZ Compliance (%) for each Vehicle Class (2023DfT National Fleet)

Vehicle Class	Compliant (%)	Non-compliant (%)
Car (Diesel)	78.1	21.9
Car (Petrol)	99.6	0.4
LGV	81.6	18.4
HGV	91.6	8.4

- Traffic flow data from the 2016 traffic survey is used (this is to maintain consistency with the Jacobs traffic modelling).
- The Emission Rate colour scheme is:
  - Black: Highest emissions rates (> 0.15 g/km/s).
  - Red: Emission rates between 0.08 - 0.15 g/km/s.
  - Blue: Low emission rates (< 0.08 g/km/s).
- It is important to note that high emission rates do not necessarily correspond to high concentrations as this depends on the dispersion characteristics for each road (e.g. buildings and street canyons).

All Roads in Model

- Base Scenario NO_x Emissions Rates (2023) are shown in Figure 14 and Figure 20. This shows roads with the highest emission rates are Princes Street (West End), Leith Street, Queensferry Road and Glasgow Road. When compared to the Base 2019 Scenario (Figure 3), NO_x emissions are predicted to be lower, which is due to lower emitting vehicles entering the fleet.

Figure 14: Base NO_x Emission Rates 2023 (g/km/s)

- It is useful to compare emissions across the whole city for both Large LEZ (Figure 15) and Small LEZ (Figure 16) options. This shows that emissions are predicted to fall for both LEZ options across the city, particularly Queensferry Road, Ferry Road, North/South Bridge and London Road.
- There are also benefits to air quality across the city as a result of the LEZ in the 2023 'future' scenario. The Jacobs LEZ traffic model report notes that traffic displacement around the LEZ will still occur, but will be less than the 2019 scenario.

Figure 15: Large LEZ Option (with CCT) NO_x Emission Rates 2023 (g/km/s)

Figure 16: Small LEZ Option (with CCT) NO_x Emission Rates 2023 (g/km/s)

- NO_x Emission Rates for each road section are shown as a histogram (Figure 17 - Figure 19). For both LEZ options, the number of roads coloured black and red is significantly lower than for the Base 2023 'future' scenario. This shows that the LEZ will still be effective in future years at reducing NO_x emissions across the city.

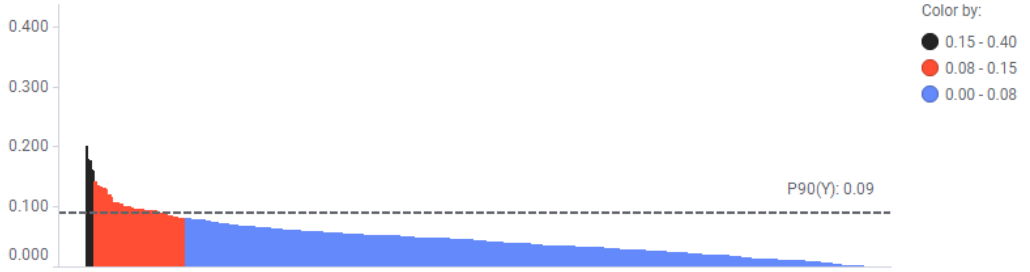


Figure 17: Base NO_x Emission Rates 2023 (g/km/s)

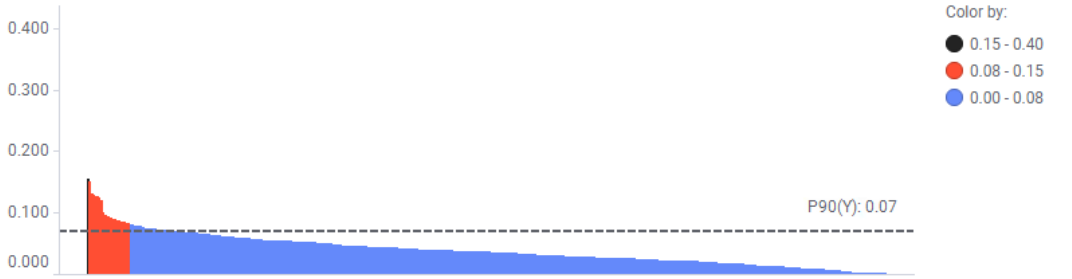


Figure 18: Large LEZ Option (with CCT) NO_x Emissions Rates 2023 (g/km/s)

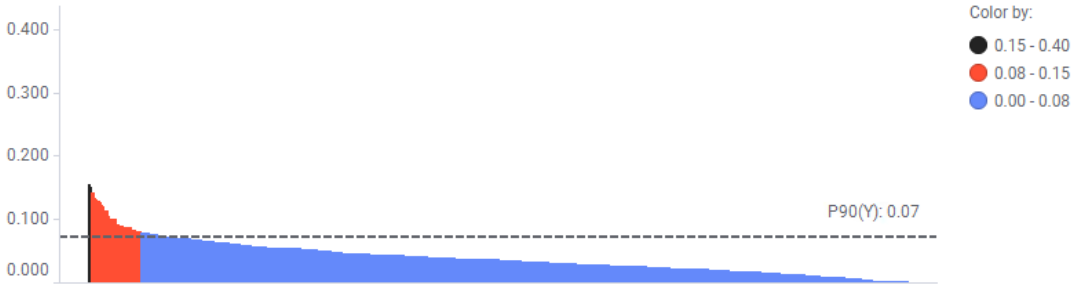


Figure 19: Small LEZ Option (with CCT) NO_x Emission Rates 2023 (g/km/s)

City Centre (around the proposed LEZ's)

- NO_x emission rates for roads in and around the proposed LEZ boundaries can be viewed in more detail in Figure 20, Figure 21 and Figure 22. This shows that in the 2023 'future' scenario, an LEZ will continue to have a positive effect on reducing emissions for both LEZ options when compared to the Base 2023 Scenario (Figure 20).

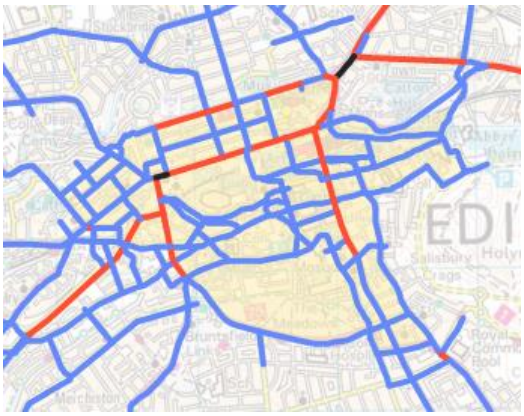


Figure 20: Base NO_x Emission Rates 2023 (g/km/s) (Yellow Zone is Large LEZ)

Figure 21: Large LEZ Option (with CCT) NO_x Emission Rates 2023 (g/km/s)s (Yellow Zone is Large LEZ)

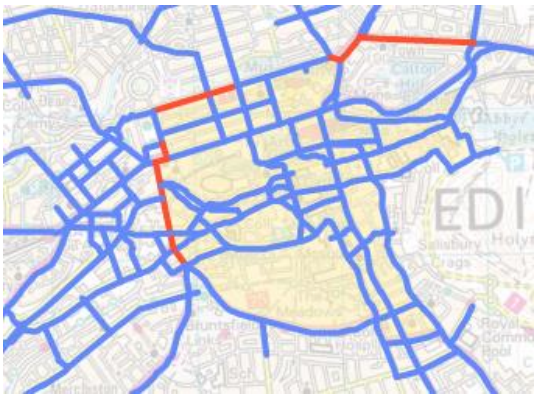
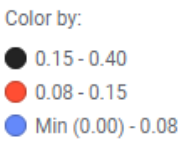


Figure 22: Small LEZ Option (with CCT) NO_x Emission Rates 2023 (g/km/s) (Yellow Zone is Small LEZ)



NOx Emission Comparison between Base and LEZ Options (2023)

- Comparison of NO_x emissions for the 2023 'future' scenario is also useful.
- Ratios of emissions between the Base and each LEZ option are shown in Figure 23 and Figure 24. This shows emissions falling within most of the LEZ. On some roads, NO_x emission rates are predicted to increase, however, these are small increases and emission rates will remain low. These increases are likely to be due to CCT changes (e.g. closure of the Mound resulting in traffic displacement).

Large LEZ

- Emission reductions of over 50% are predicted on several roads, including Princes Street, Shandwick Place, Mound and George IV Bridge. These roads have high emission rates so this represents a significant reduction in emissions. Emission rates on Princes Street are predicted to be over 50% lower than Base 2023 levels.
- Emission increases are predicted on several roads around the Large LEZ boundary; the largest percentage increases (>50%) are Chester Street, Palmerston Place, Gardiner's Crescent and Grove Street, though in most cases, the emission rates on these roads will remain low.

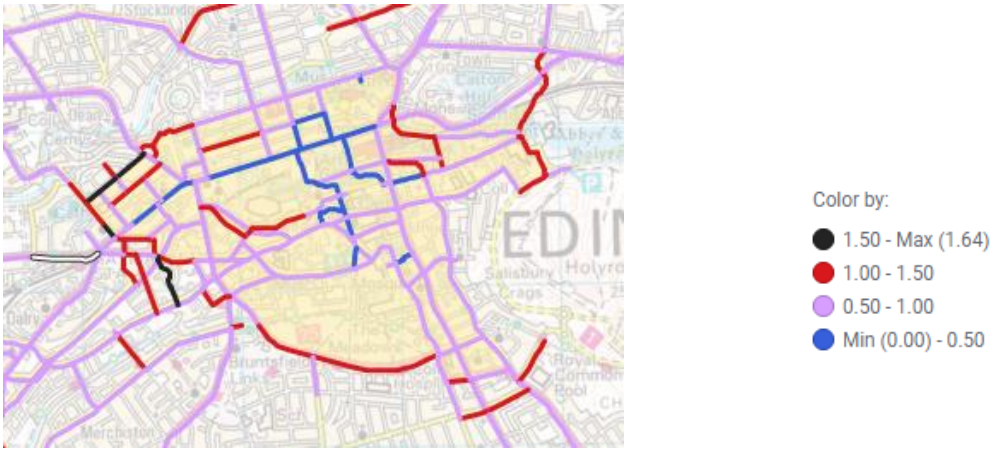


Figure 23: Ratio of Emission Changes (2023) due to introduction of Large LEZ. Black is largest % increase in emissions (> 50%)

Small LEZ

- NO_x Emission reductions of over 50% are predicted on several roads, including Princes Street, Mound and George IV Bridge.
- Small NO_x emissions increases are predicted on several roads around the Small LEZ boundary, including Queen Street (between Charlotte Square and Dundas Street), Charlotte Square (East side), Melville Drive, Horse Wynd and West Preston Street.

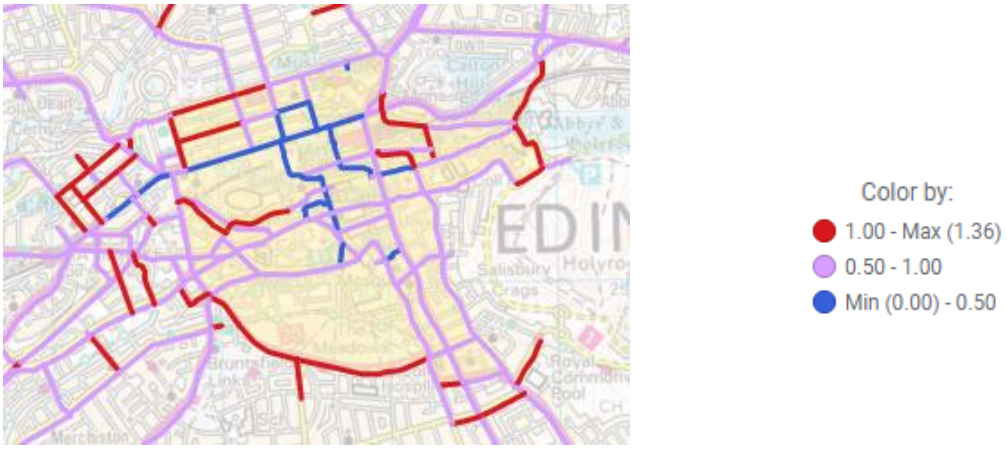


Figure 24: Ratio of Emission Changes (2023) due to introduction of Small LEZ.

Detailed Analysis in Key Areas

Palmerston Place/Chester Street

- Palmerston Place and Chester Street are 2 streets where the Jacobs traffic modelling report indicates that would be significant displacement of traffic to avoid the Large LEZ.
- Ranking histograms (Figure 25 - Figure 30) show the distribution of NO_x emission rates for each road in the city, with Chester Street and Palmerston Place highlighted. This shows emission rates on these roads significantly move up the emission rate rankings with increased emission rates.
- Relative changes in emissions for Chester Street and Palmerston Place, when compared to the Base 2019 scenario can be seen in Figure 31 and Figure 32 respectively.
- 2019 Large LEZ option:
    - NO_x emission rates are predicted to increase by around 85% for Palmerston Place and Chester Street
    - Air Quality modelling predicts NO_2 concentrations which will result in new model exceedances (Chester Street: from ~36 µg m^{-3} to ~45 µg m^{-3}; Palmerston Place: from ~39 µg m^{-3} to ~49 µg m^{-3}).
    - Emission rate increases are due to a combination of increased traffic flows and an increase in non-compliant (higher emitting) vehicles.
- 2019 Small LEZ option:
    - NO_x emission rates are predicted to increase by a comparatively smaller 6%,
    - Air Quality modelling predicts a negligible change to NO_2 concentrations.
- 2023 Large LEZ 'future' option:
    - NO_x emission rates are predicted to be 5-8% higher when compared to the Base 2023 scenario.
    - When compared to the Base 2019 scenario, emission rates are predicted to decline by 4% and 2.7% for Palmerston Place and Chester Street respectively. This is due to a higher percentage of vehicle being LEZ compliant, and so fewer vehicles will need to divert around the Large LEZ boundary.
    - Air Quality modelling predicts NO_2 concentrations of around 34 µg m^{-3} (which is around 2-3 µg m^{-3} lower than current levels).
- 2023 Small LEZ 'future' option:
    - NO_x emission rates are predicted to decrease by 32%
    - Air Quality modelling predicts NO_2 concentrations of around 30 µg m^{-3} (which is around 5-6 µg m^{-3} lower than current levels).
- For the Large LEZ option, although increased NO_2 concentrations and new model exceedances are predicted, these are expected to be short lived. This is because as newer, lower emitting vehicles enter the fleet, the overall percentage of compliant traffic will increase in future years, and hence fewer vehicles will be required to avoid the LEZ.
- Model exceedances (kerbside concentrations) are worst case and further air quality modelling will be carried out for these streets to assess the risk at building façades.

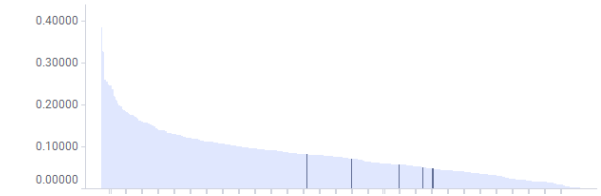


Figure 25: Base Run (2019) Emission Rates ranked for each road, showing Chester Street and Palmerston Place highlighted

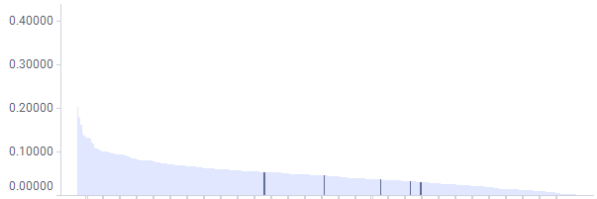


Figure 26: Base Run (2023) Emission Rates ranked for each road, showing Chester Street and Palmerston Place highlighted

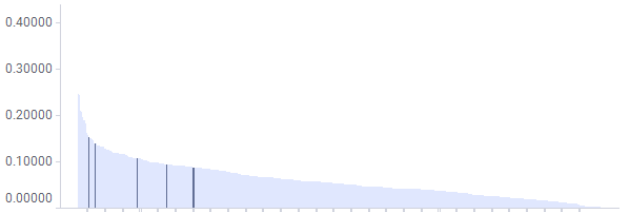


Figure 27: Large LEZ option (2019) Emission Rates ranked for each road, showing Chester Street and Palmerston Place highlighted

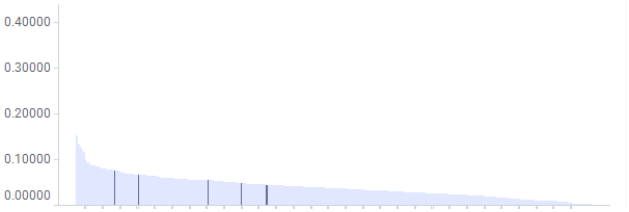


Figure 28: Large LEZ option (2023) Emission Rates ranked for each road, showing Chester Street and Palmerston Place highlighted

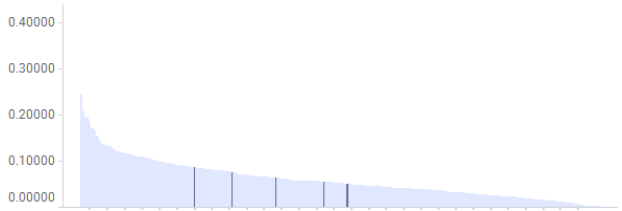


Figure 29: Small LEZ option (2019) Emission Rates ranked for each road, showing Chester Street and Palmerston Place highlighted

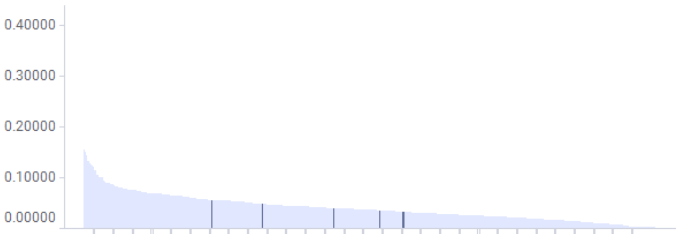


Figure 30: Small LEZ option (2023) Emission Rates ranked for each road, showing Chester Street and Palmerston Place highlighted

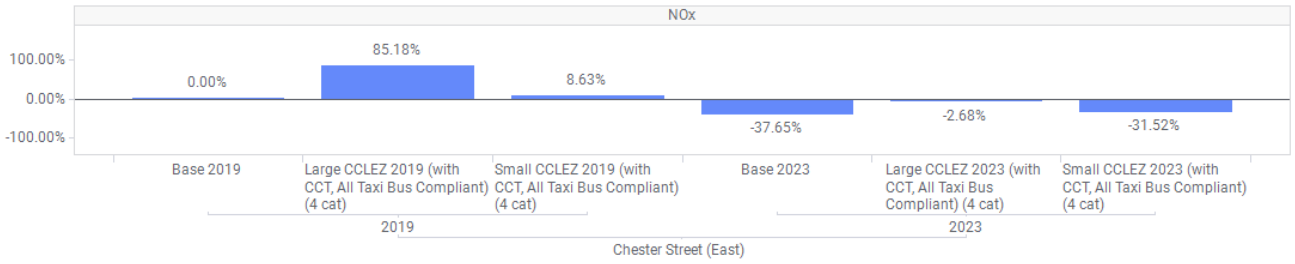


Figure 31: Relative Changes in Emission Rates (Chester Street) compared to Base 2019 Scenario

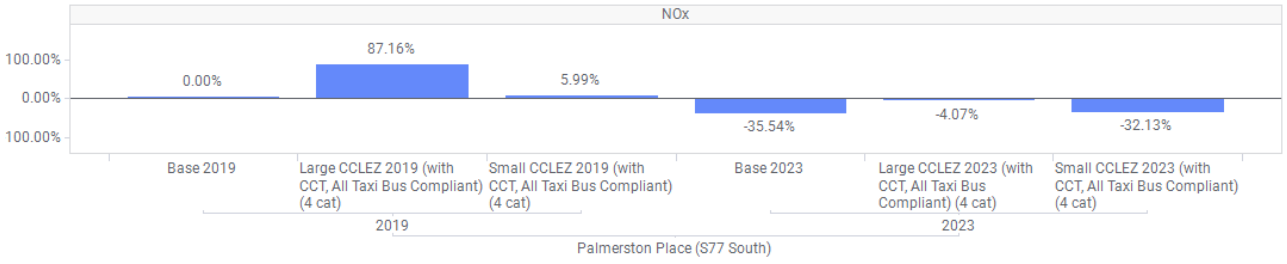


Figure 32: Relative Changes in Emission Rates (Palmerston Place) compared to Base 2019 Scenario.

Grove Street/Gardiner's Crescent

- Grove Street and Gardiner's Crescent are 2 streets where traffic modelling predicts vehicle flows will increase if the Large LEZ is selected, due to non-compliant vehicles re-routing to avoid it.
- 2019 Large LEZ option:
    - NO_x emission rates for the 2019 Large LEZ option are predicted to increase by 99% on Gardiner's Crescent, and 65% on Grove Street (Figure 35).
    - NO_x emission rates are low in the Base (Figure 9, Figure 33) are predicted to remain low if the Large LEZ is selected (Figure 10, Figure 34).
    - Air Quality modelling predicts NO_2 concentrations will increase on both roads, no new model exceedances are predicted (Gardiner's Crescent: From ~32 µg m^{-3} to ~36 µg m-3; Grove Street: From ~31 µg m^{-3} to ~33 µg m^{-3}).

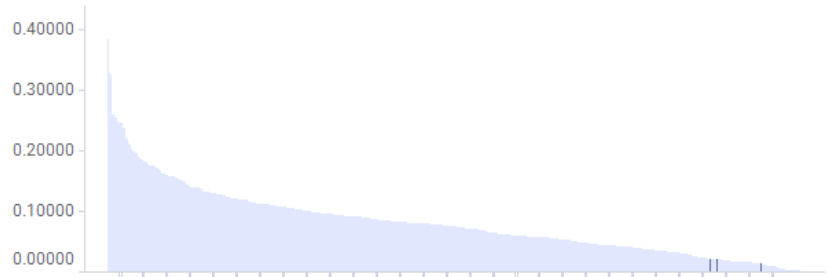


Figure 33: Base (2019) Emission Rates ranked for each road, showing Gardiner's Crescent and Grove Street highlighted

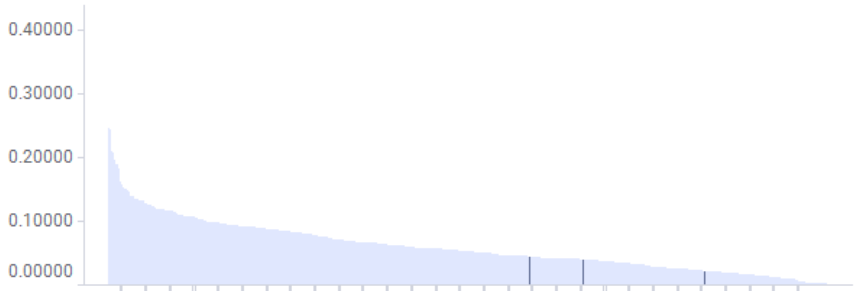


Figure 34: Large LEZ option (2019) Emission Rates ranked for each road, showing Gardiner's Crescent and Grove Street highlighted

- 2019 Small LEZ option:
    - NO_x emission rates for the 2019 Large LEZ option are predicted to increase by 28% on Gardiner's Crescent, and 4% on Grove Street.
    - Air Quality modelling predicts NO_2 concentrations increase will be negligible and no new model exceedances are predicted.
- 2023 'future' LEZ options:
    - NO_x emissions on Grove Street are predicted to decline for the Base and both LEZ options by 15 – 35% when compared to the Base 2019 scenario.
    - NO_x emission rates on Gardiner's Crescent are predicted to increase by 5% for the Small LEZ option when compared to the Base 2019 scenario.
    - Air Quality modelling for both streets predicts NO_2 concentrations of around 27 µg m^{-3} (which is around 4 µg m^{-3} lower than current levels) for both LEZ options.

- For the 2023 ‘future’ scenario, no new model exceedances are expected.

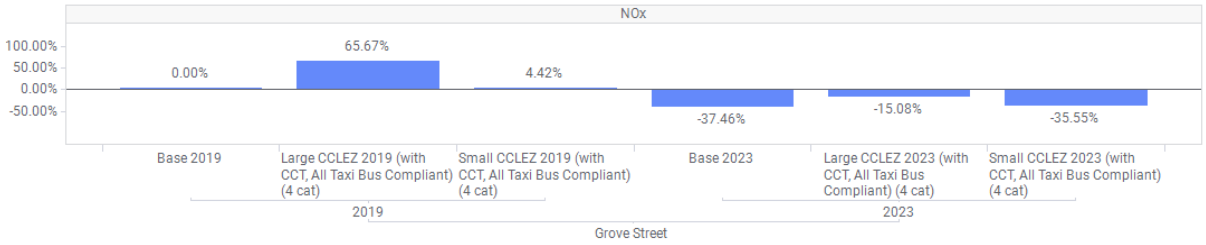


Figure 35: Relative Changes in Emission Rates (Grove Street) compared to Base 2019 Scenario.

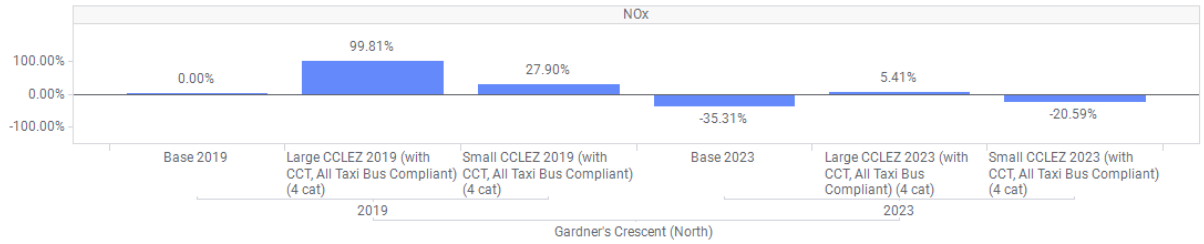


Figure 36: Relative Changes in Emission Rates (Gardiner’s Crescent) compared to Base 2019 Scenario.

Detailed Analysis within the LEZ Boundary

Princes Street

- The introduction of either LEZ option will significantly reduce emission rates on Princes Street compared to the respective Base Scenarios.
- NO_x emission rates are predicted to decrease by 76% if either LEZ option is selected (Figure 37). No difference is expected between 2019 and 2023 scenarios as this street is dominated by buses that will be compliant with LEZ rules.
- Air Quality modelling predicts that NO_2 concentrations are predicted to fall to around 30 µg m^{-3} and therefore model exceedances will be no longer exist.

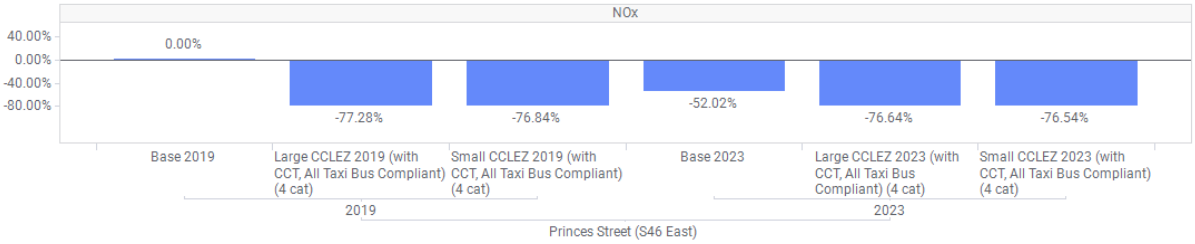


Figure 37: Relative Changes in Emission Rates (Princes Street) compared to Base 2019 Scenario.

South Bridge

- The introduction of either LEZ option will significantly reduce emission rates on South Bridge compared to the respective Base Scenarios.
- 2019 LEZ options:
  - NO_x emission rates are predicted to decrease by 56% if either LEZ option is selected (Figure 38).
  - Air Quality Modelling predicts that NO_2 concentrations will decline by around 16 µg m^{-3} to between 38 and 45 µg m^{-3}. Air quality model exceedances are predicted to remain.
- 2023 'future' LEZ options:
  - NO_x emission rates are predicted to decrease by 64% (when compared to 2019 levels) if the either LEZ option is selected (Figure 38).
  - Air Quality Modelling predicts that NO_2 concentrations will decline by around 21 µg m^{-3} (compared to 2019 levels) to between 36 and 39 µg m^{-3} and therefore model exceedances will be no longer exist.

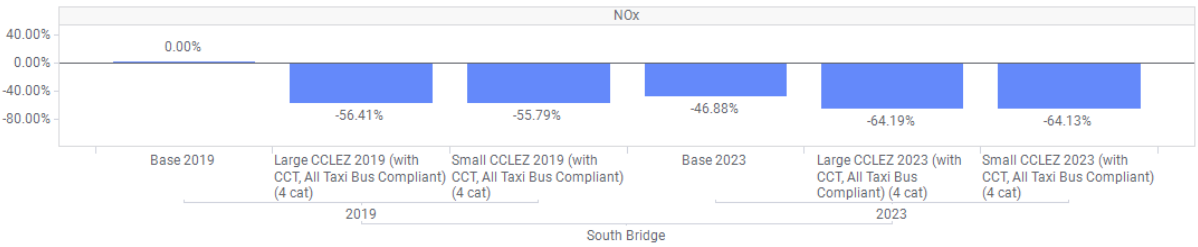


Figure 38: Relative Changes in Emission Rates (South Bridge) compared to Base 2019 Scenario.

Leith Street

- The introduction of either LEZ option will significantly reduce emission rates on Leith Street compared to the respective Base Scenarios.
- 2019 LEZ options:
  - NO_x emission rates are predicted to decrease by 55% if the either LEZ option is selected (Figure 39).
  - Air Quality modelling predicts that NO_2 concentrations would decline by around 12 µg m^{-3} to around 39-41 µg m^{-3}. It is expected that some (though perhaps not all) model exceedances will no longer exist.
- 2023 'future' LEZ options:
  - NO_x emission rates are predicted to decrease by 62% (when compared to 2019 levels) if either LEZ option is selected (Figure 39).
  - Air Quality Modelling predicts that NO_2 concentrations will decline by around 17 µg m^{-3} (compared to 2019 levels) to between 34 and 39 µg m^{-3} and therefore model exceedances will be no longer exist.

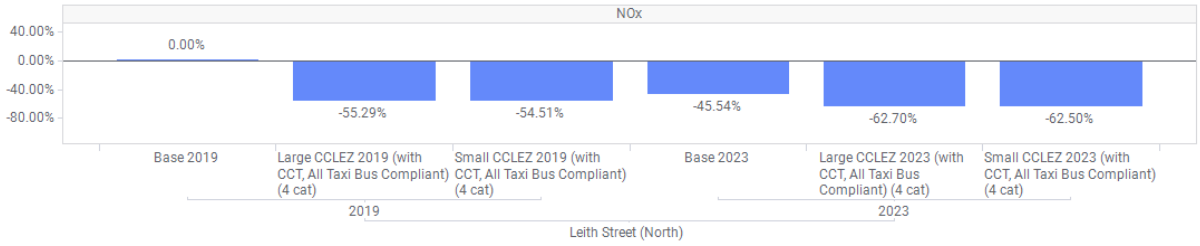


Figure 39: Relative Changes in Emission Rates (Leith Street) compared to Base 2019 Scenario.

West Port/Grassmarket/Cowgate

- The introduction of either LEZ option will reduce emission rates on West Port and Cowgate compared to the respective Base Scenarios. This route has few buses and is dominated by other vehicle types.
- 2019 LEZ options:
  - NO_x emission rates are predicted to decrease by 40% on West Port/Grassmarket and 30% on Cowgate if the either LEZ option is selected (Figure 40, Figure 41).
  - Air Quality modelling predicts that NO_2 concentrations would decline by around 15 µg m^{-3} on West Port and 12 µg m^{-3} on Cowgate. However, due to the deep canyons and poor dispersion on these roads, model exceedances are still predicted (concentrations would be around 45 µg m^{-3}).
- 2023 'future' LEZ options:
  - NO_x emission rates are predicted to decrease by 47% (when compared to 2019 levels) if the either LEZ option is selected (Figure 40, Figure 41).
  - Air Quality modelling predicts that NO_2 concentrations would decline by around 20 µg m^{-3} on West Port and 18 µg m^{-3} on Cowgate. However, due to the deep canyons and poor dispersion on these roads, model exceedances are still predicted on Cowgate (concentrations would be around 41 µg m^{-3}). On West Port, predicted concentrations are around 39.9 µg m^{-3}, so although model exceedances will no longer exist, it is very close to the 40 µg m^{-3} threshold.

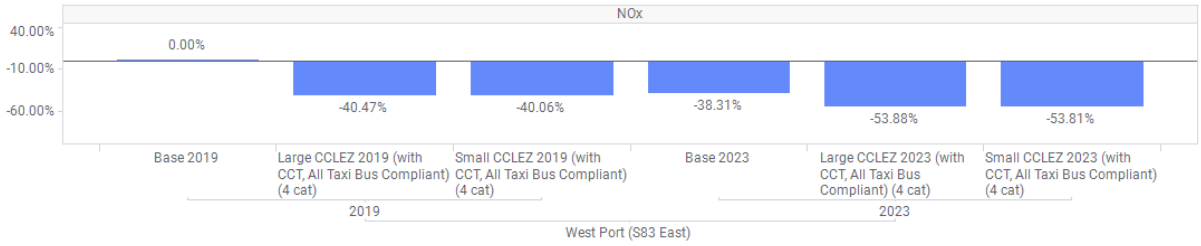


Figure 40: Relative Changes in Emission Rates (West Port) compared to Base 2019 Scenario.

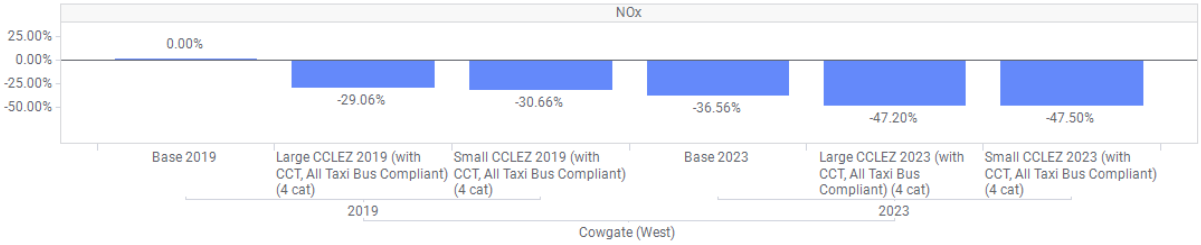


Figure 41: Relative Changes in Emission Rates (Cowgate) compared to Base 2019 Scenario.

Detailed Analysis around the LEZ Boundary

Queen Street (between Frederick Street and Charlotte Square)

- The introduction of either LEZ option will have a small effect on emission rates on Queen Street compared to the respective Base Scenarios.
- 2019 Large LEZ option:
  - NO_x emission rates are predicted to decline by 7% if the Large LEZ is selected (Figure 42).
  - Air Quality modelling predicts NO_2 concentrations are expected to decline by around 3 µg m^{-3}. On the section between Frederick Street and Charlotte Square, NO_2 concentrations are predicted to remain above 40 µg m^{-3} and model exceedances will remain.
- 2019 Small LEZ option:
  - NO_x emission rates are predicted to increase by 7% if the Small LEZ is selected (Figure 42).
  - Air Quality modelling predicts NO_2 concentrations are expected to increase by around 1 µg m^{-3}. On the section between Frederick Street and Charlotte Square, NO_2 concentrations are predicted to remain above 40 µg m^{-3} and model exceedances will remain.
- 2023 'future' LEZ options:
  - NO_x emission rates are expected to decline by around 40% for all scenarios when compared to the Base 2019 scenario, which will be due to fleet turnover.
  - Air Quality Modelling predicts that NO_2 concentrations will decline (Large LEZ option by around 12 µg m^{-3}; Small LEZ option by around 10 µg m^{-3}) when compared to 2019 levels) to between 34 and 39 µg m^{-3}.
  - On Albyn Place, predicted concentrations are likely to remain just above 40 µg m^{-3} for both LEZ options (Large LEZ option: 41 µg m^{-3}; Small LEZ option: 43 µg m^{-3}), therefore model exceedances will remain

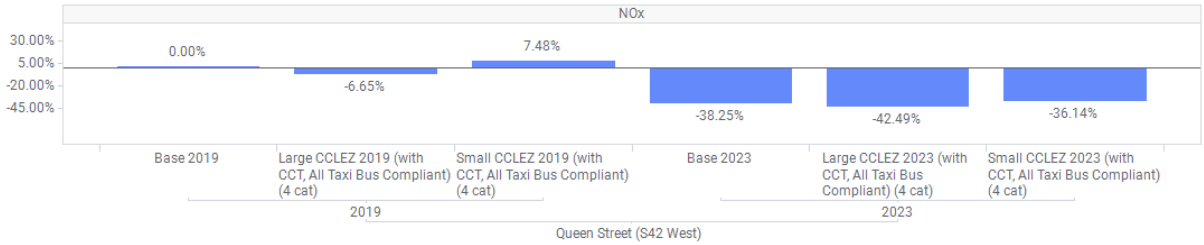


Figure 42: Relative Changes in Emission Rates (Queen Street) compared to Base 2019 Scenario.

Abbeyhill

- The introduction of either LEZ option is predicted to slightly increase emission rates on Abbeyhill compared to the Base Scenario.
- 2019 LEZ options:
  - NO_x emission rates are predicted to increase by 10% if the Large LEZ is selected and increase by 4% of the Small LEZ is selected (Figure 43).
  - Air Quality modelling predicts NO_2 concentrations would increase slightly (~ 1 µg m^{-3}) for both LEZ options. Current air quality modelling predicts concentrations at kerbside points to be around 40 µg m^{-3} threshold. A small increase in emissions may

result in some new model exceedances. Further detailed modelling will be carried out to predict concentrations at building façades.

- 2023 'future' LEZ options:
    - NO_x emission rates are expected to decline by between 33% and 40% for all scenarios when compared to the Base 2019 scenario. The variation suggests that there will still be some traffic displacement if the Large LEZ option is selected as emission rates are not falling as fast as the Base 2023 scenario.
    - Air Quality Modelling predicts that NO_2 concentrations will decline by around 5 µg m^{-3} (compared to 2019 levels) to around 34 µg m^{-3} and therefore model exceedances will be no longer exist.

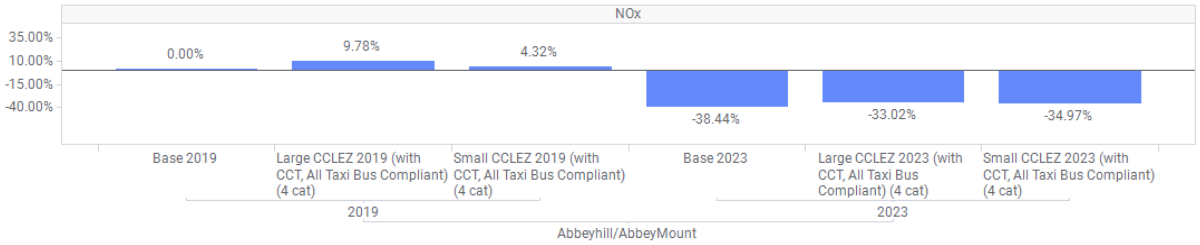


Figure 43: Relative Changes in Emission Rates (Abbeyhill) compared to Base 2019 Scenario.

West Preston Street

- The introduction of either LEZ option will increase emission rates on West Preston Street compared to the 2019 Base scenario.
- 2019 LEZ options:
    - NO_x emission rates are predicted to significantly increase by 37% if the Large LEZ is selected and by 40% of the Small LEZ is selected (Figure 44).
    - The ranking histograms in Figure 45 - Figure 47 show that the emission rates for the LEZ options will remain low.
    - Air Quality modelling predicts NO_2 concentrations are expected to increase from 33 µg m^{-3} to 37 µg m^{-3} for both LEZ options. This is predicted to be below the 40 µg m^{-3} threshold, therefore no new model exceedances are predicted.
- 2023 'future' LEZ options:
    - NO_x emission rates are expected to decline by 26% for either LEZ option and by 35% for the Base 2023 scenario, when compared to the Base 2019 scenario. The variation suggests that there will still be some traffic displacement if the Large LEZ is selected as emissions are not falling as fast as the Base 2023 scenario.
    - Air Quality Modelling predicts that NO_2 concentrations will decline by around 3 µg m^{-3} (compared to 2019 levels) to around 30 µg m^{-3} and therefore model exceedances will be no longer exist.

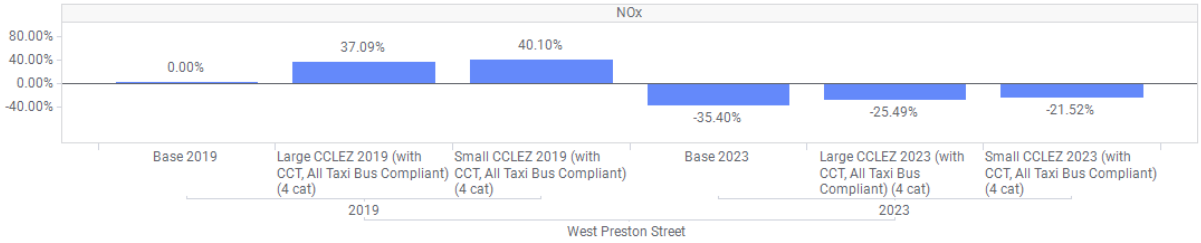


Figure 44: Relative Changes in Emission Rates (West Preston Street) compared to Base 2019 Scenario.

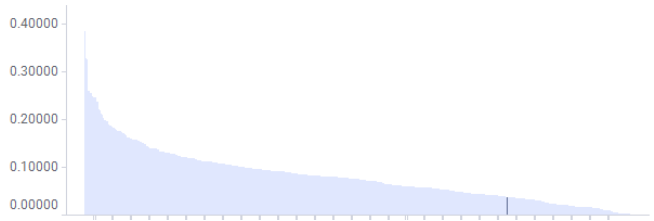


Figure 45: Base Scenario (2019) Emission Rates ranked for each road, showing West Preston Street highlighted

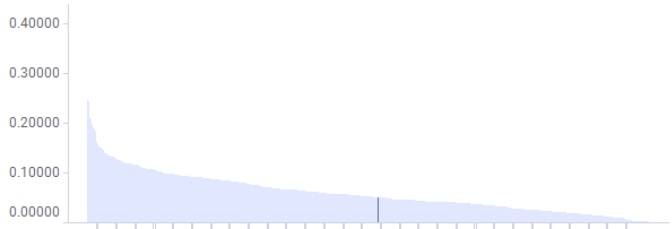


Figure 46: Large LEZ option (2019) Emission Rates ranked for each road, showing West Preston Street highlighted

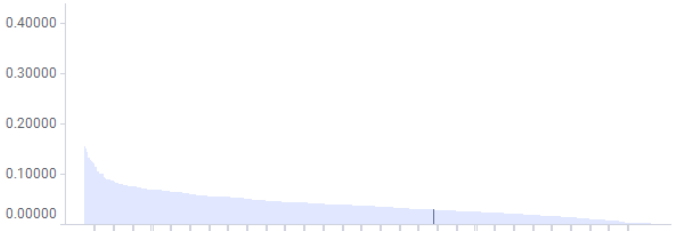


Figure 47: Small LEZ option (2019) Emission Rates ranked for each road, showing West Preston Street highlighted

Melville Drive (Meadows)

- The introduction of either LEZ option will slightly increase emission rates on Melville Drive compared to the 2019 Base scenario.
- 2019 LEZ options:
    - NO_x emission rates are predicted to slightly increase by 0.7% if the Large LEZ is selected and increase by 5.5% of the Small LEZ is selected (Figure 48).
    - Air Quality modelling predicts negligible increases of NO_2 concentrations; they are currently around 33 µg m^{-3} and so no new exceedances are predicted.
- 2023 'future' LEZ options:

- NO_x emission rates are expected to decline by around 35% for all scenarios when compared to the Base 2019 scenario.
- As emission changes between the LEZ options and Base scenario for the relevant year are very small, the effect on air quality due to LEZ traffic displacement is negligible.

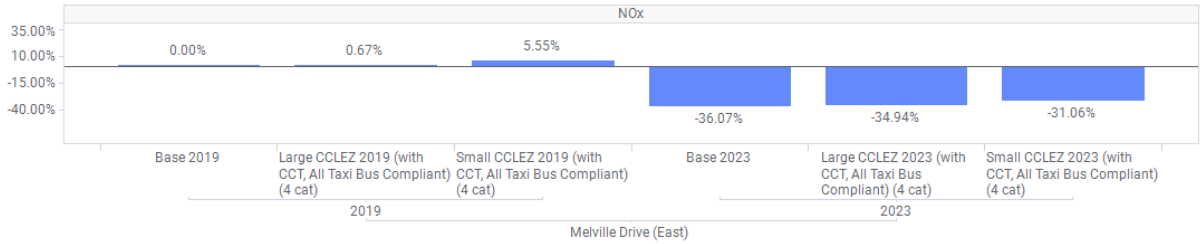


Figure 48: Relative Changes in Emission Rates (Melville Drive) compared to Base 2019 Scenario.

Lothian Road (between West Approach Road and Lothian Road)

- Lothian Road is within the Large LEZ option (all traffic will be compliant), but not in the Small LEZ option (where non-compliant traffic can continue to use this road).
- The introduction of either LEZ option will reduce emissions on Lothian Road compared to the 2019 Base run.
- 2019 LEZ options:
  - NO_x emission rates are predicted to decline by 47% if the Large LEZ is selected and by 28% of the Small LEZ is selected.
  - Although non-compliant traffic being able to use Lothian Road for the Small LEZ option, the large reduction in emissions is due to a large number of buses and taxis on this road which will have become compliant with LEZ rules.
  - Despite large emission reductions, model air quality exceedances are predicted to remain for both LEZ options, though the Large LEZ would have a greater impact on improving air quality. Air Quality modelling predictions for NO_2 concentrations are:
    - Base 2019: 60-70 µg m^{-3}
    - Large LEZ option: 45-55 µg m^{-3}
    - Small LEZ option: 55-65 µg m^{-3}
- 2023 'future' LEZ options
  - NO_x emission rates are expected to decline by (when compared to Base 2019 levels):
    - Base 2023: 44%
    - Large LEZ option: 60%
    - Small LEZ option: 52%
  - Air Quality modelling predictions for NO_2 concentrations are:
    - Large LEZ option: 35-45 µg m^{-3}
    - Small LEZ option: 43-50 µg m^{-3}
  - Model exceedances are still predicted, however concentrations are around 5 µg m^{-3} lower on Lothian Road if the Large LEZ option is selected in preference to the Small LEZ option

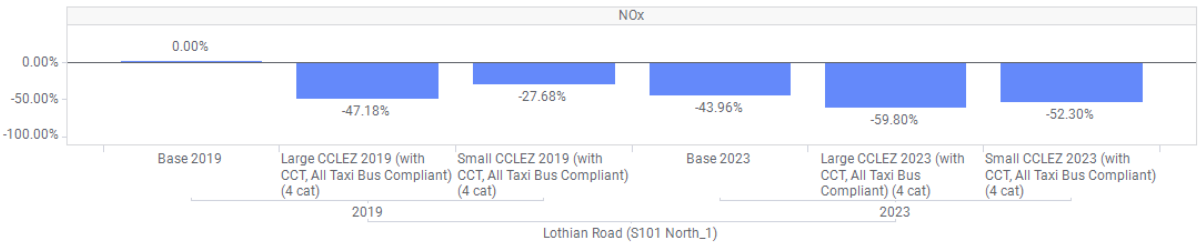


Figure 49: Relative Changes in Emission Rates (Lothian Road) compared to Base 2019 Scenario.

North Charlotte Street

- North Charlotte Street is within the Large LEZ (all traffic will be compliant), but not in the Small LEZ (where non-compliant traffic can continue to use this road).
- 2019 LEZ options:
- If the Large LEZ option is selected, NO_x emission rates are predicted to decline (Figure 50), however if the Small LEZ option is selected, NO_x emissions are predicted to increase.
    - Predicted NO_x emission changes:
        - Large LEZ option: NO_x emission rates decline by 31%
        - Small LEZ option: NO_x emissions rates increase by 14%
    - NO_x emission rates are predicted to increase for the Small LEZ as there are very few buses on this road (all buses becoming compliant accounts for emission reduction on Lothian Road)
    - Air Quality modelling predicts NO_2 concentrations are slightly increase for the Small LEZ option, but decline for the Large LEZ option. Predicted NO_2 concentrations are:
        - Base 2019: 40 µg m^{-3}
        - Large LEZ: 33 µg m^{-3}
        - Small LEZ: 41 µg m^{-3}
- 2023 'future' LEZ options:
    - NO_x emissions are predicted to decline for all options, however the Large LEZ option will still have an impact on reducing emissions on this road in the future.
    - Air Quality Modelling predicts that NO_2 concentrations will decline by around 7-10 µg m^{-3} (compared to 2019 levels) to around 30 µg m^{-3} and therefore model exceedances will be no longer exist.

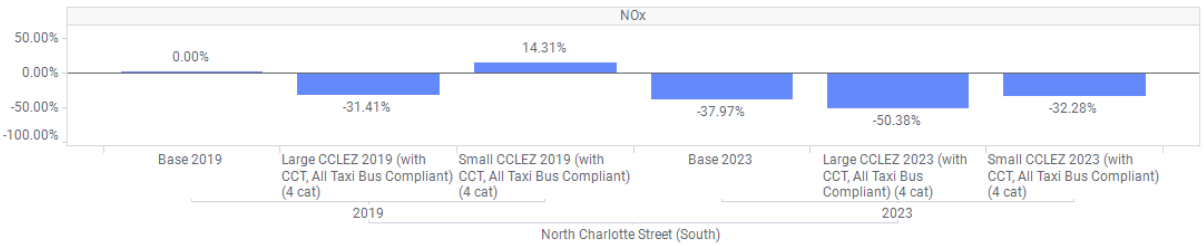


Figure 50: Relative Changes in Emission Rates (North Charlotte Street) compared to Base 2019 Scenario.

Detailed Analysis in other AQMA's

St John's Road

- St John's Road is part of the Corstorphine AQMA.
- 2019 LEZ options:
  - NO_x emission rates are predicted to decline by 24% for both LEZ options (Figure 51). This is likely to be due to buses and taxis moving to full compliance so they can operate within the city centre LEZ regardless of whether this is the Large or Small LEZ.
  - Air Quality modelling predicts NO_2 model concentrations will decline from 53 µg m^{-3} to 48 µg m^{-3}, so model exceedances are expected to remain.
- 2023 'future' LEZ options:
  - NO_x emission rates are predicted to decline by 40% for the Base 2023 scenario and by around 48% for both LEZ options.
  - Air Quality Modelling predicts that NO_2 concentrations will decline by around 10-15 µg m^{-3} (compared to 2019 levels) to around 30 µg m^{-3} on most of St John's Road and therefore, model exceedances at most locations are expected to no longer exist.
  - However, predicted concentrations on the section between Kirk Loan and Clermiston Road are expected to remain just above 40 µg m^{-3} and model exceedances remain there.

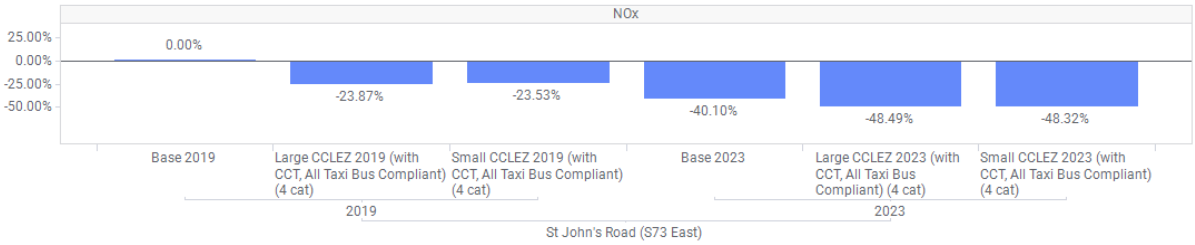


Figure 51: Relative Changes in Emission Rates (St Johns Road) compared to Base 2019 Scenario.

Ferry Road (by Inverleith Row)

- This street is in part of the Inverleith AQMA.
- 2019 LEZ options:
  - NO_x emission rates are predicted to decline by 7-8% for both LEZ options when compared to the Base 2019 scenario (Figure 52). This is likely to be due to buses and taxis moving to full compliance so they can operate within the city centre LEZ, regardless of whether this is the Large or Small LEZ.
  - Air Quality modelling predicts NO_2 concentrations decline slightly (by around 1 µg m^{-3}) for both LEZ options. Current air quality modelling predicts concentrations at kerbside points to be around the 40 µg m^{-3} threshold. A small reduction in emissions may not remove all model exceedances (note that monitored data shows no exceedances since 2018). Further detailed modelling will be carried out to predict concentrations at building façades.
- 2023 'future' LEZ options:
  - NO_x emissions are predicted to decline significantly by 40-43% for the 2023 scenarios.

- Air Quality Modelling predicts that NO_2 concentrations will decline by around 10 µg m^{-3} (compared to 2019 levels) to between 30 and 34 µg m^{-3} and therefore model exceedances will be no longer exist.

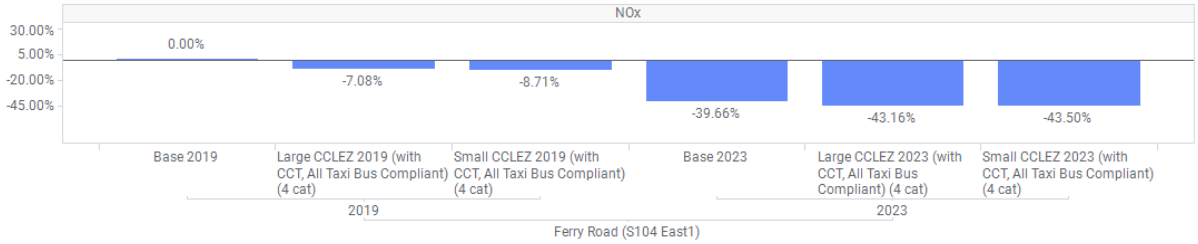


Figure 52: Relative Changes in Emission Rates (Ferry Road, by Inverleith Row) compared to Base 2019 Scenario.

Great Junction Street (by Foot of Leith Walk)

- This street is in part of the Leith AQMA.
- 2019 LEZ options:
  - NO_x emission rates are predicted to decline by 32% for both LEZ options when compared to the Base 2019 scenario (Figure 53). This is likely to be due to buses and taxis moving to full compliance so they can operate within the city centre LEZ, regardless of whether this is the Large or Small LEZ.
  - Air Quality modelling predicts NO_2 concentrations decline slightly (by around 3 µg m^{-3}) for both LEZ options. Current air quality modelling predicts concentrations at kerbside points to be around the 40 µg m^{-3} threshold. A small reduction in emissions may not remove all model exceedances (note that monitored data shows no exceedances since 2017). Further detailed modelling will be carried out to predict concentrations at building façades.
- 2023 'future' LEZ options:
  - NO_x emission rates are predicted to decline significantly by 43-55% for the 2023 scenarios.
  - Air Quality Modelling predicts that NO_2 concentrations will decline by around 12 µg m^{-3} (compared to 2019 levels) to around 32 µg m^{-3} and therefore model exceedances will be no longer exist.

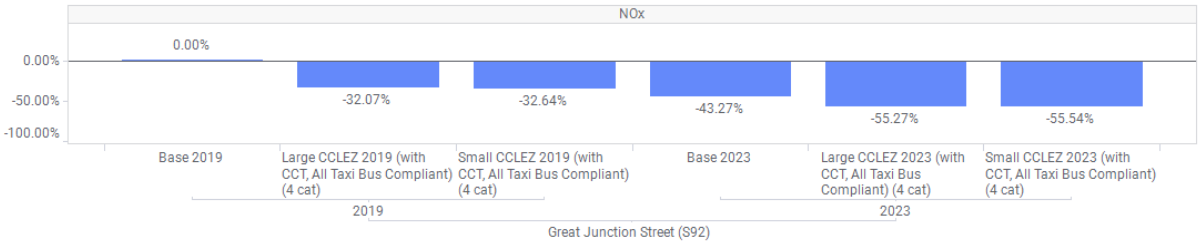


Figure 53: Relative Changes in Emission Rates (Great Junction Street, by the Foot of the Walk) compared to Base 2019 Scenario.

Next Steps

- Complete air quality modelling which has been delayed to due to the cyberattack that reduced SEPA's modelling capabilities.
- Source apportionment to identify the impact of each vehicle class on air quality on different roads.
- Carry out an analysis of Particulate Matter and Carbon Dioxide emissions.
- Further ANPR surveys are required to monitor the changes in the fleet so that the rate of air quality improvements can be monitored.

Edinburgh Low Emission Zones - Options Appraisal

May 2021

Introduction

The indicative National Programme timeline is for LEZs to be implemented in the four largest Scottish Cities between February and May 2022. Most of the capital funding from Transport Scotland to facilitate enforcement of the scheme is available in the current financial year. At the implementation date, grace periods begin for each of the different vehicle types involved in the Scheme, to allow time to prepare. Grace periods can be a minimum of one year and maximum of four. Residents are allowed up to an additional two years. Enforcement of the LEZ begins after the grace periods expire.

Over the summer (2021) CEC will consult on the preferred scheme. Autumn and early winter will allow time for consideration of the consultation feedback and proceed through the new legal process to declare a LEZ, prior to the Local Authority or Scottish Ministers considering approval of the scheme. Both bodies have the power to call the scheme in for an *examination* which would mean the national timeline dates could not be achieved.

Appraisal Approach

The Edinburgh LEZ options appraisal described herein, has been undertaken with regard to the National Low Emission Framework (NLEF). NLEF is an **evidence-based** appraisal process developed to help local authorities consider transport related actions to improve local air quality.

The primary aim of the NLEF is to **improve local air quality** in areas where Scottish Air Quality Objectives (AQOs) are exceeded, or likely to be exceeded, and transport is identified as the key contributor. LEZ Schemes in Scotland are also mandated to reduce the contribution of traffic to local pollution.

Actions to improve air quality could potentially result in a reduction in CO_2 emissions due to vehicle owners switching to more sustainable modes of transport, hence as a secondary objective, local authorities are encouraged to consider whether actions identified through the NLEF appraisal process can help support reductions in emissions of CO_2 within their areas.

The National Modelling Framework (NMF) provides a significant proportion of the quantitative evidence required within the NLEF appraisal process. It links traffic modelling outputs with air quality modelling, to allow for consideration of the wider traffic management measures in the context of improving local air quality. SEPA have standardised data collection, analysis and presentation of model outputs for each of the four Scottish Cities delivering LEZ schemes, and have produced Air Quality Evidence reports and detailed analysis to this affect. These take account of traffic analysis from 2016, 2019 and 2020.

The Scottish Government's recently published LEZ regulations and emerging guidance is also considered as part of this appraisal.

Edinburgh Low Emission Zones - Options Appraisal

Key Principles and Objectives

A number of Key Principles (KPs) were considered to help develop high level outline appraisal and in further detail, the Primary and Secondary Objectives were assessed against strengths, weaknesses, opportunities, threats and related mitigations.

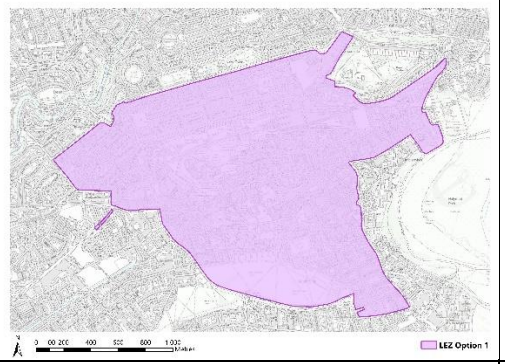
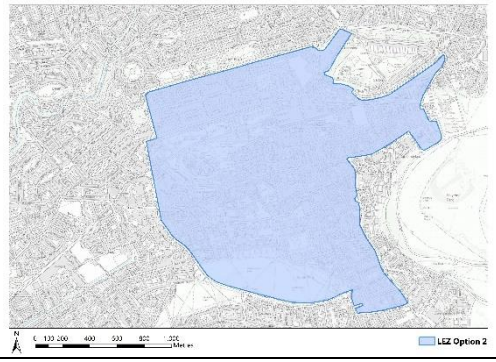
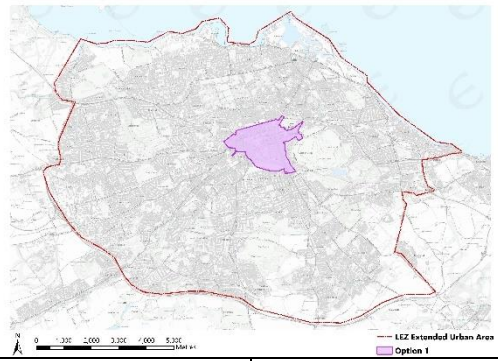
The Key Principles have been established using the NLEF process and the LEZ objectives in consultation through the governance structure of the Scheme Development – the Delivery Group which includes representatives from SEPA, Transport Scotland and SEStran.

The KPs and objectives consider LEZ impacts regarding air quality and traffic management in particular. Wider impacts are also considered (Feasibility and Deliverability) in the context of the geographical extent of the LEZ, the vehicles affected with each Option and the grace periods.

Options Appraised

This Appraisal examines the following **three options** for the LEZ scheme in Edinburgh in terms of the boundary, types of vehicles included, and the grace periods (see appendix for explanation of terms and definitions):

Edinburgh Low Emission Zones - Options Appraisal

	Option 1	Option 2	Option 3	
Scheme	*City Centre LEZ*	*City Centre LEZ*	*Extended Urban Area LEZ with City Centre*	
Description	Originally proposed City Centre boundary as presented in 2019 for consultation, with minor amendments. Grace period two years, which is different from the 2019 proposal, where one year was to be allowed for commercial-type vehicles (HGVs, LGVs, Minibus, Buses & Coaches and Taxis) and four years for cars.	Revised City Centre boundary - amended following NMF assessment of the traffic and air quality impacts.	Extended Urban Area (formally named 'Citywide boundary') is as presented in 2019 for consultation, plus either city centre option	
Boundary	*Original* 	*Revised* 	*Option 1 or 2* 	*Extended Urban Area*
Vehicle types included	*All*	*All*	*All*	*HGVs, LGVs, Minibus, Buses & Coaches and Taxis*
Grace Period (years)	*2*	*2*	*2*	*3*

2019 Consultation

Edinburgh Low Emission Zones - Options Appraisal

The Council ran a consultation from 27 May to 21 July 2019 regarding the proposed Low Emission Zones (LEZs) which focused on the proposed boundaries, vehicle types, grace periods and any unintended consequences. The proposed boundaries comprised a city centre boundary (referred to in this Appraisal as Option 1) and an extended urban area boundary formally referred to as the 'citywide' boundary (referred to in this Appraisal as Option 3). The consultation did not include the revised City Centre boundary (referred to as Option 2 in this Appraisal) - this has been explored in response to updated NMF assessment of traffic and air quality impacts.

Overall, findings from the consultation showed that cleaner air is important to all, but there were mixed views as to the suitability of the LEZ and to its specific aspects. General public and commercial audiences agree, albeit with differing priorities. For all however, vital questions to consider are the cost of LEZ compliance to them; the cost to life in Edinburgh (clean air, goods/services); and looking at a bigger, city and regional picture to tackle underlying issues (traffic flow, public transport, etc).

Summary of 2019 consultation responses	
City Centre LEZ (Option 1)	
Boundary	Mixed views: 54% agreed, 46% disagreed with boundary Most disagreement related to the LEZ overall – desiring a better approach, a better public transport offer, and voicing worries about the financial effect on businesses and individuals. Main issues included worry about increased traffic and pollution in neighbouring streets/parks; the desire to make the area larger; and to include New Town/up to Ferry Road.
Vehicle types	Most said each vehicle type should be included, comments were mainly about considering exemptions, like motorbikes/scooters, buses/public transport, private cars, deliveries/ tradesmen
Grace periods	Mixed views, with more acceptance for 1 year for buses and coaches and commercial vehicles, albeit only just over 50% saying 'about right' and evenly mixed views for 4 years for private cars and 5 years for city centre residents with cars.
Action taken	34% said their vehicle would comply, so no action was needed The Top 5 most mentioned actions as a result of the LEZ were: 30% use public transport more; 24% walk more; 20% bike more; 18% upgrade vehicle; and 16% change route.
Extended Urban Area with City Centre (formally referred to as 'Citywide' Boundary) (Option 3)	
Boundary	More in favour: 62% agreed, 37% disagreed with boundary Again, most comment regarding disagreement related to the LEZ and that it will negatively affect business/trade/deliveries. Main issues cited were that it should be smaller, should only be the City Centre, and should include the airport.
Vehicle types	Comments reflected the same exemptions as City Centre, but more felt all private cars should be included, 9% (v. 3% exempt)
Grace periods	Again, mixed views with an evenly mixed response for both 3 year periods between 'too short', 'about right' and 'too long'.

Since the 2019 consultation:

- The Draft Low Emission Zones (Scotland) Regulations 2021 were presented to Scottish Parliament in January 2021 and will become law in May 2021;
- The Council published its City Mobility Plan in February 2021 which sets out the strategic approach to the sustainable, safe and effective movement of people and goods and a strong commitment to meeting the net zero carbon target by 2030 including through behaviour change, infrastructure provision and network management tools. It confirms a commitment to developing a LEZ scheme along with many other related measures such as electric vehicle charging infrastructure, expansion of Controlled Parking Zones, Workplace Parking Levy, and a 'Pay as you Drive' scheme, if necessary, to tackle congestion and support cleaner air;
- COVID-19 pandemic has and continues to have a significant impact on travel behaviour and the economy;
- Air quality improvements across the City are being realised with natural fleet turnover and bus upgrades progressed to date;
- Funding from the Scottish Government has included;
    - £2.4 million from public transport (PTP) funding, used to implement bus priority measures.
    - Bus Emissions Abatement Retrofit (BEAR) Phases 1 and 2 were awarded to allow 130 vehicles to be retrofitted across Scotland. BEAR Phase 3 funding (£9.75 million) was fully subscribed in the 2020/21 financial year. Lothian Buses obtained funding 20/21 to retrofit 188 Euro V buses. Other buses and coaches that are likely to operate in Edinburgh will also be retrofitted.
    - Sept 20 – LEZ Mobility Fund announced - offering cash incentives (Support Fund) and Travel Better vouchers (encouraging the switch to more sustainable modes of transport). Funding awards for the 20/21 financial year since September included;
        - Low income households just over £80,000
        - Small/micro businesses £282,500
        - Retrofitting (nearly all taxis) £300,000
- The NMF air quality and traffic modelling that supported the 2019 consultation has been updated by SEPA to support this Appraisal, in terms of emission analysis and interim air dispersion modelling.

Edinburgh Low Emission Zones - Options Appraisal

Appraisal - Summary of Conclusions

Key Principles:

- The City Centre area has the greatest magnitude of traffic related pollution problems and breaches of **statutory Air Quality Objectives (AQOs).** Options 1 and 2 support compliance with AQOs and are supported by a **strong evidence-base** which highlights the Central Air Quality Management Area (AQMA) as the focus for targeted interventions. SEPA recommends the Central AQMA as a priority for a LEZ scheme. This evidence-based approach lies at the centre of the appraisal and the resultant *Preferred Scheme* recommendation.

- Option 3 extended urban area plus city centre boundary is expected to have limited impact on air quality when taking into consideration current fleet composition and indicative trends - air quality improvements across the City are being realised with natural fleet turnover and bus upgrades progressed to date.

- Options 1 and 2 are the most feasible and deliverable taking account of the timescales for implementation and the funding available:
  - Option 3 is the least **deliverable** due to scale of proposals and limited timescale in which to deliver key infrastructure. Development of LEZ schemes are supported by grant funding from Transport Scotland, which must be spent in the financial year 21/22, to meet workstream objectives
  - Option 3 is the least **feasible** due to revenue budgetary implications for the Council in respect to operational costs. The penalty charge approach for Scottish LEZs could be offset by any revenue collected from penalty charges; however, this is likely to be limited due to the deterrent nature of the scheme. Option 1 and 2, with moderate infrastructure quantities, are preferred for minimising operational costs.

- Opportunities to **align with Edinburgh City Centre Transformation (ECCT)** are maximised in Options 1 and 2.

- Option 3 – extended urban area boundary has least impact on meeting this Appraisal's Key Principles and Objectives.

Primary Objective:

- Option 1 is preferred over Option 2 for delivering **air quality improvement** benefits since it includes a wider population and a larger portion of the City Centre, including **greater coverage of the Central AQMA**, highlighted by SEPA as LEZ priority. Future (NMF) scenarios analysis predicts any modelled air quality impacts, related to traffic displacement for Option 1, are short-lived.

Secondary Objectives:

- Option 1 is preferred over options 2 and 3 to support positive **behaviour change (modal shift from private car)**, since it includes a wider population and a larger portion of the City Centre where interventions to **reduce car dominance will have the greatest cumulation of positive impacts**, in tandem with other measures (e.g. Controlled Parking Zone, Workplace Parking Levy, and other potential demand management initiatives, such as 'Pay as you Drive').

- Option 1 is preferred over options 2 and 3 for the **contribution towards net zero** greenhouse gases target which will predominantly occur as a result of a shift to sustainable travel modes, rather than from fleet compliance.

- All options will require the implementation of **network management mitigation measures**;
  - Localised traffic network impacts modelled for option 1, are short term, effect a smaller population and not present in the future year scenario.
  - However, pre-existing localised modelled exceedances are exacerbated, effect a larger population and continue to show exceedances in the long term if option 2 is selected.
  - Option 2 has the potential to conflict with development of the City Centre (CCWEL) strategic Active Travel corridor, with increase vehicular demand expected on same parts of the network.

- All option impacts can be limited via a 2-year grace period.

Preferred LEZ Scheme Recommendation:

Option 1 – City Centre (original boundary) is recommended as the preferred LEZ scheme boundary. It is also recommended that all vehicles be included in the Scheme and that a grace period of 2-years should apply.

Edinburgh Low Emission Zones - Options Appraisal

DETAILED APPRAISAL

Summary of Key Principles and Objectives

<table>
<tr><th colspan="2">Key Principles (KPs)</th></tr>
<tr><td>KP1 Improve Air Quality
KP1.1. Compliance with statutory Air Quality Objectives
KP1.2. AQ Improvement in Central AQMA
KP1.3. AQ Improvement in other AQMA
KP1.4. Complementary Measures
KP1.5. General Fleet Compliance Trends</td><td rowspan="2">KP3: Feasibility and Deliverability
KP3.1 Impact Assessment
KP3.1.1 Equality, Health and Wellbeing and Human Rights
KP3.1.2 Economic including socio-economic disadvantage
KP3.2 Costs
KP3.2.1 Implementation costs
KP3.2.2 Operational Costs
KP3.2.3 Associated Cost
KP3.4 Design principles
KP3.4.1 Street clutter
KP3.4.2 Heritage impact
KP3.4.3 Enforcement system design
KP3.4.4 COVID-19 impact
KP3.5 Communications & Engagement
KP3.5.1 Scheme complexity
KP3.5.2 Public opinion</td></tr>
<tr><td>KP2: Evidence-based, targeted approach
KP2.1. NMF Assessment
KP2.2. NMF Reporting
KP2.3. Detailed analysis with Spotfire software
KP2.4. Taking account of COVID-19 impacts</td></tr>
<tr><td></td><td>KP4: Strategic Placemaking & Sustainable Travel
KP4.1 Placemaking
KP4.2 Mobility & Transport
KP4.3 Climate Change</td></tr>
<tr><th colspan="2">Objectives</th></tr>
<tr><td>Primary Objective
P1. Improve Air Quality - Contribute towards reduction of NO_X emissions</td><td>Secondary Objectives
S1. Reduce Carbon Emissions
S2. Network Management
S3. Behaviour Change</td></tr>
</table>

Edinburgh Low Emission Zones - Options Appraisal

Key Principle (KP)		1. City Centre – Original *All vehicle types*	2. City Centre – Revised *All vehicle types*	3. City Centre + Extended Urban Area *City Centre - All vehicles* *Extended Urban Area - HGVs, LGVs, Minibus, Buses & Coaches and Taxis*
KP1: Improve Air Quality	*KP1.1 Compliance with statutory Air Quality Objectives*	Air quality improvements across the City are being realised with natural fleet turnover and bus upgrades progressed to date (*Ref. CEC Air Quality Annual Progress Report (2021)).* However, the City Centre area has the greatest magnitude of traffic related pollution problems and breaches of the Air Quality Objectives (AQO). A targeted LEZ City Centre intervention is required. See Complementary measures KP1.4.		Air quality improvements have been realised across the whole of the City. (See left.) Amendment of Air Quality Management Area (AQMA) order for the St John's Road AQMA is being progressed due to the *hourly* Air Quality Objective being met for the past four consecutive years. Revocation of the Inverleith Row (Ferry Road) and Great Junction Street AQMAs is also being considered due to compliance with the statutory AQO for the past two and three years respectively.
		SEPA's Initial Air Quality Evidence report (2019) supports development of a LEZ in Edinburgh (ref) to address breaches of the Air Quality Objectives. The report recommended a LEZ covering the Central AQMA be investigated further. The need to reduce harmful levels of air pollution as quickly as possible remains a priority (Ref. emerging LEZ guidance), therefore a City Centre LEZ should be progressed as a priority.		A LEZ for the City Centre must be included in an Edinburgh scheme. The addition of an Extended Urban Area LEZ that affects all vehicles except cars, will have limited added air quality benefit (see KP1.5).
	*KP1.2. AQ Improvement in **Central AQMA***	Both options 1 and 2 will contribute towards improved air quality in the City Centre which is predominately covered by the Central AQMA. Buses are the major contributing factor due to the repeat nature of trips and the high-emitting vehicle, however, due to the scale of the exceedances in this area all vehicle types will need to be incorporated.		Further improvement from Extended Urban Area LEZ on the Central AQMA will be limited due to geographical differences. Limited additional benefit from bus and coach sector as majority already impacted by the City Centre boundary. High percentage of HGV in traffic found on arterial routes. *Note* Cars are not included in the Extended Urban Area boundary as only a marginal improvement in pollution is

Key Principle (KP)		1. City Centre – Original *All vehicle types*	2. City Centre – Revised *All vehicle types*	3. City Centre + Extended Urban Area *City Centre - All vehicles* *Extended Urban Area - HGVs, LGVs, Minibus, Buses & Coaches and Taxis*
				forecasted. This is predominately due to the Euro 6 performance - tighter emissions testing criteria for the newer Euro 6c and 6d vehicles are predicted to give more pollution reduction benefit, than early Euro 6's *(Ref, 2019 Initial Report)*.
	*KP1.3. AQ improvement in **other AQMAs***	A City Centre LEZ does not significantly change predicted pollution concentrations for AQMA's away from the City Centre (e.g. St John's Road, Glasgow Road (Newbridge), Inverleith Row/Ferry Road, Great Junction Street and Salamander Street) due to displaced traffic. No new exceedances are predicted in these areas. However, it is expected air quality will improve as 'cleaner' vehicles enter the fleet quicker than natural turnover and hence emissions are reduced over time.		Further improvement from Extended Urban Area LEZ expected to be limited taking into consideration the impact of current fleet composition and indicative trends (see KP1.5). Although there is uncertainty on what travel will look like post the COVID-19 pandemic (see KP3.4.4), there is also concern about the impact on LGV owners, in particular (KP3.1.2).
	KP1.4 Complementary Measures	Despite the potential for improvement by vehicle fleet changes with a LEZ, it will be difficult to meet the statutory Air Quality Objectives in some areas of the Central AQMA (*REF 2019 SEPA Initial Report)*. Busy narrow streets with tall buildings will be particularly challenging. In these locations, other measures to reduce emissions will be required. It will be important to align with the Councils strategic traffic and public realm improvement projects with the LEZ work (see KP4.1 & KP4.1). The Council is also committed to revising the Air Quality Action Plan in 2021-22.		The Council's revised Air Quality Action Plan will address traffic emissions across the City but can also include targeted interventions in the other AQMAs. Feasibility work has been undertaken for junction improvements that would reduce traffic queueing and pollution concentrations further in the St John's Road AQMA. Part-funding has been awarded from Scottish Government to progress this work in 2021/22. Glasgow Road (Newbridge) AQMA was scoped outside the Extended Urban Area boundary. Feasibility work through the AQAP process highlighted targeted interventions at this location, which has already seen

Key Principle (KP)		1. City Centre – Original *All vehicle types*	2. City Centre – Revised *All vehicle types*	3. City Centre + Extended Urban Area *City Centre - All vehicles* *Extended Urban Area - HGVs, LGVs, Minibus, Buses & Coaches and Taxis*
				improvements in air quality through the installation of an urban traffic control system (MOVA).
	KP1.5. General Fleet Compliance Trends	All vehicle types are included in scheme, increasing overall compliance rates and supporting AQ improvements in the Central AQMA. Current levels of vehicle compliance across the entire Edinburgh fleet is 68%. With LEZs design to ensure a faster turnover of fleet than the natural turnover, LEZs need to be implemented in a timely manner to realise effectiveness of such a scheme. A targeted City Centre scheme would support this principle.	Commercial fleet compliance data shows potential for limited air quality improvements across the wider City area, due to high percentage of complaint HGV's and buses & coaches, which are high-emitting vehicles. The effectiveness of the Extended Urban Area LEZ could be limited. Below is traffic survey data obtained February 2020 for Euro VI vehicles or better (compliant vehicles); • HGVs: 76-95% Euro VI or better • Buses & coaches: 61% operators - excluding Lothian Buses Lothian Buses commitment to be 100% LEZ compliant by the end 2021. • LGV: 48% Euro VI or better (increase from 7% in 2016) LGVs could be disproportionately affected with the Extended Urban Area LEZ taking account of the level of non-compliance and the economic impacts associated with the commercial-type vehicles sector (*KP3.1.2.*) in the Extended Urban Area LEZ, in particular. *Notes.* Majority of buses and coaches will need to upgrade with City Centre option, in any case. Taxi and private hire car compliance will be met through licensing conditions.

Edinburgh Low Emission Zones - Options Appraisal

Key Principle (KP)		1. City Centre – Original *All vehicle types*	2. City Centre – Revised *All vehicle types*	3. City Centre + Extended Urban Area *City Centre - All vehicles* *Extended Urban Area - HGVs, LGVs, Minibus, Buses & Coaches and Taxis*
KP2: Evidence-based, targeted approach	*KP2.1. NMF Assessment*	SEPA National Modelling Framework Initial Air Quality Evidence Report (2018) recommends that LEZ should focus on City Centre to maximise AQ impacts. All vehicle types to be included.		SEPA NMF Initial Air Quality Evidence Report (2018) considered the impact of whole City improvements in fleet. However, report recommended targeted approach on City Centre.
	KP2.2. NMF Reporting	SEPA Interim Air Quality Evidence and Analysis Report (2021) focuses on AQ impact of the City Centre boundary Options, due to traffic displacement that might arise from manoeuvres to avoid the LEZ. Traffic modelling was undertaken to inform the air quality modelling.		Traffic modelling for the Extended Urban Area boundary was screened out - displacement of traffic is less of an issue for the Extended Urban Area boundary, as commercial vehicles are more likely to need to upgrade their vehicles in order to continue operations.
	KP2.3. Detailed analysis with Spotfire software	Detailed analysis using Spotfire software of traffic surveys in 2016, 2019 and 2020 was undertaken by SEPA. Analysis of the bus sector shows a general pattern to eradicate the older buses from the main operator's fleet (Euro III) however the percentage composition of Euro classes in the fleet does tend to change on a year to year basis. A Low Emission Zone will be an important tool in setting consistent standards on the environmental performance of the bus fleet.		Detailed analysis using Spotfire software of traffic surveys in 2016, 2019 and 2020 was undertaken by SEPA. As per above in KP1.3. commercial fleet analysis shows increasing trend in compliance and hence likely limited impact of Extended Urban Area LEZ.
	KP2.4. Taking account of COVID-19 impacts	LEZ scheme development work was considered as a part of COVID-19 impact analysis by Transport Scotland. (REF) Four identified plausible futures (with varying traffic demand and vehicle compliance levels) were considered against the NMF model assessments. The assessment work was found to be robust to variations in network conditions that may occur in a post-pandemic world. The work also concludes LEZs are still		Post-COVID-19 impact uncertainty is greater with addition of a Extended Urban Area boundary due to increased scale of scheme.

Key Principle (KP)		1. City Centre – Original *All vehicle types*	2. City Centre – Revised *All vehicle types*	3. City Centre + Extended Urban Area *City Centre - All vehicles* *Extended Urban Area - HGVs, LGVs, Minibus, Buses & Coaches and Taxis*
		required to improve AQ and protect the City Centres.		
KP3: Feasibility and Deliverability	*KP3.1 Impact Assessment*	Funding was sought from Transport Scotland to undertake a detailed Impact Assessment Study. This coupled with the Council's Integrated Impact Assessment (IIA) approach, the following information is useful for the appraisal process. *Note.* The Environment and Sustainability aspects of the IIA are covered elsewhere as major features of the appraisal.		
	KP3.1.1 Equality, Health and Wellbeing and Human Rights	LEZs will reduce emissions and improve air quality and in turn have a positive effect on health on everyone, particularly of those most at risk of respiratory illness including older people and children (including unborn children). This is the most significant positive impact of the LEZ and will have health and wellbeing benefits for a large population of residents, workers, and visitors to the area over a long period of time; therefore, the magnitude of the effect is substantial.		
		An added indirect impact of the LEZ may be the resulting health benefits from a mode shift from private vehicle travel to active travel or public transport modes - relevant to the City Centre LEZ.		
		Certain sectors of society could be more adversely impacted by the City Centre LEZ due to increasing costs in public transport, should operators pass any costs in upgrading/replacing their fleet onto users. Transport related businesses could also see increased prices in this regard. Carers may also own a non-compliant and be restricted for journeys within the City Centre LEZ. These impacts can be part-offset with the available grants/financial support to assist vehicles owners replace or upgrade their vehicles or by	The Extended Urban Area LEZ will provide wider effect for LGVs that are minibuses providing community transport services (care providers, youth groups, school groups, elderly care providers). Any impacts experienced by those providing care support could adversely affect those receiving care, for example, if the cost of care is increased. This can be part-offset with the available grants/financial support to assist vehicles owners replace or upgrade their vehicles or by encouraging more sustainable travel (financial support also available here see S3).	

Key Principle (KP)	1. City Centre – Original *All vehicle types*	2. City Centre – Revised *All vehicle types*	3. City Centre + Extended Urban Area *City Centre - All vehicles* *Extended Urban Area - HGVs, LGVs, Minibus, Buses & Coaches and Taxis*
	encouraging more sustainable travel (financial support also available here see S3).		
	Low income householders, people with low literacy/numeracy, minority ethnic people (including non-English speakers) could be impacted if there is low awareness of the scheme's rules and receive a penalty charge. This is more so for car users that might be affected by the City Centre LEZ. It will be important to ensure effective communication of the scheme.		
	People with a disability who must use their car which is non-complaint may have forgone their journey to the City Centre adversely affecting opportunity to access community and leisure facilities negatively impacting on social activity. This impact is to be off-set with the financial grants available in addition to the proposal that Blue badge will be included in the list of national exemptions for LEZs across Scotland (emerging draft guidance).		
KP3.1.2 Economic including socio-economic disadvantage	An estimation of **potential** economic impact was undertaken, looking at around 20,000 non-compliant vehicles in Edinburgh's travel to work area (as a reasonable near-future year projection) if **all** vehicles were affected. The estimated costs associated with upgrading this number of vehicles to be compliant is around £120m. This financial outlay will be significantly lower for two reasons: not every vehicle type will be subject to the LEZ, so fewer vehicles will be required to upgrade and some non-compliant vehicles will not interact with the LEZ in the first place therefore avoiding the need to be upgraded. In addition to the financial outlay required to purchase an upgraded vehicle, there are other potential economic costs associated with replacing a large number of vehicles such as consumer welfare loss and asset value loss which can be as much as £43m and £65m respectively. As before, it is unlikely that this full value will be realised but it is an impact assessment on the economy that was undertaken for the LEZ development work in Edinburgh.		

Key Principle (KP)	1. City Centre – Original *All vehicle types*	2. City Centre – Revised *All vehicle types*	3. City Centre + Extended Urban Area *City Centre - All vehicles* *Extended Urban Area - HGVs, LGVs, Minibus, Buses & Coaches and Taxis*
	Increased economic activity for a number of sectors: second-hand car traders, vehicle scrappage, vehicle leasing operators, active-travel distributors/repairers, City car club and public transport operators through increased patronage. Although, some sectors and industries that are reliant on vehicles and have a fleet of non-compliant vehicles may be adversely affected by the LEZ and may be forced to reduce operations.		
	The IIA identified the potential economic costs of replacing vehicles. Private car owners will most likely be affected to a lesser degree as they are only included in the City Centre LEZ.		The IIA identified the potential economic costs of replacing vehicles a high priority. Commercial-type vehicles will be most significantly affected due to their inclusion in the Extended Urban Area LEZ. According to Federation of Small Businesses figures, Scottish SMEs are heavily reliant on cars, vans and lorries for their daily operations and travelling into work. The introduction of a LEZ would impact SMEs in different ways due to the varied nature of the businesses
	The IIA also considered the reduction in the access and provision of goods/services and how businesses are impacted as they will face restrictions in how they can operate. Individuals are given fewer options as they either have to reconsider how they access the good/service or the good/service is no longer being offered. This will especially affect who are reliant on private vehicle transport but do not have access to finance to achieve compliance.		The wider Extended Urban Area LEZ will have more of an impact in this regard. Small enterprises represent over 90% of businesses in Edinburgh. Sixty three percent of companies rely upon vehicles, most likely LGVs, to deliver goods or drive to clients to provide a service, therefore, this sector where non-compliance rates are at 48% could be disproportionately affected by the Extended Urban Area LEZ.
	Restricting non-compliant cars from the City Centre may cause certain members of society (lower income households) to be dissuaded from using or working in the City Centre. However, the LEZ scheme financial support funds and other		Vehicle users, especially LGV, bus, coach, minibus and HGV, have relatively long turnover periods, requiring users to change earlier than anticipated. The need to purchase compliant vehicles and sell/scrap their non-compliant vehicle means that the users could incur additional

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		wider council policies and support, encourage the shift to more sustainable forms of transport.		financial cost. This will also affect the City Centre LEZ, however the Extended Urban Area boundary is more extensive in geographic area.
		Through the changing environment of the city centre with less pollution, some people and businesses may be more attracted to the area, generating more economic activity.		
	KP3.2 Costs (see appendix)	First principles are to ensure value for money in terms of capital spend and as low additional revenue cost to the Council as feasible, with a view to achieving the AQ objectives.		
	KP3.2.1 Implementation costs	A high-level estimate of the implementation costs for enforcement infrastructure involved for a City Centre LEZ is £550k. It is expected that this cost is covered by Transport Scotland grant funding.		In addition to the costs mentioned left, a high-level estimate of the implementation costs for enforcement infrastructure involved for a Extended Urban Area LEZ is double – approximately £1m. It is also expected that this cost would be covered by Transport Scotland grant funding.
		Funding from Transport Scotland for capital investment for enforcement system is available in the 2021/22 financial year. Design, purchasing and installation would have to be receipted this financial year. The programme timeline is very challenging, with statutory consultation over the summer and legal processing towards the end of the year. Hence there are risks with the funding. There is ongoing dialogue with Transport Scotland on these timing issues, however targeting the City Centre LEZ may need to be a priority.		See left – in addition for the Extended Urban Area boundary, the added complication is with respect the infrastructure which would have to be installed but not operational for the longer grace period (3 years). This would incur maintenance costs, which would have to be met by the Council.

Key Principle (KP)	1. City Centre – Original *All vehicle types*	2. City Centre – Revised *All vehicle types*	3. City Centre + Extended Urban Area *City Centre - All vehicles* *Extended Urban Area - HGVs, LGVs, Minibus, Buses & Coaches and Taxis*
KP3.2.2 Operational Costs	As Edinburgh currently has existing software and systems that could be used for enforcement of the LEZ, costs are estimated to be in the region of £400k to £700k per year. There will be budgetary implications for the Council in respect to these operational costs. They could be offset by any revenue collected from penalty charges; however, revenue is likely to be limited due to the deterrent nature of the scheme (see KP3.4.3). Additional or external funding support is not available to cover these costs.		See left. The addition of the Extended Urban Area boundary will mean increased operational costs, which will have further budgetary implications.
KP3.2.3 Associated Cost	Costs are also associated with boundary mitigation measures to deal with the potential for displaced traffic. This forms part of the Network Management Plan (*See Objective S2 below*). These would also have to be met by the Council.		In addition to the City Centre costs, it is expected there would be no major additional cost for the Extended Urban Area boundary in dealing with network mitigations measures. This is due to the fact that displaced traffic for Extended Urban Area LEZ would be limited due to the nature of the fleet (and the need for the majority of it to be upgraded). Also see S2 objective below. If any additional costs are identified through unintended consequences, these costs would have to be met by the Council.
	Other elements of the Network Management Plan will also incur costs, such as the signage and traffic signals strategy, including any scope for Intelligent Traffic Signals. Capital funding is expected from Transport Scotland for signage in 2022/23 financial year. Other costs will have to be met by the Council.		See left. Additional costs for the Extended Urban Area boundary in terms of signage are expected to be significantly higher due to the presence of the trunk road network on the Extended Urban Area boundary. Again, capital funding is expected from Transport Scotland for signage in 2022/23 financial year. Any other costs will have to be met by the Council.

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	KP3.4 Design principles			
	KP3.4.1 Street clutter	Additional enforcement infrastructure e.g. ANPR camera in the urban realm will be minimised by use of existing poles or other infrastructure where possible. In addition, the preference to use mobile enforcement vehicles technology as an enforcement approach, reduces the need for multiple-camera infrastructure. The Edinburgh Design guidance will be adhered to.		
	KP3.4.2 Heritage impact	The World Heritage Site and conservation areas around the City Centre LEZ will be subject to the appropriate Planning considerations in relation to their design, context and impact. This may form part of a Planning Application and/or Environmental Impact Assessment.		The additional implications for the Extended Urban Area boundary are limited due to lack of relevant sensitive designations in the vicinity of the boundary.
	KP3.4.3 Enforcement system design	The (statutory) enforcement principle is to deter non-compliant vehicles. Therefore, the preferred enforcement approach is for ANPR cameras to cover main routes only, with other infringements detected by a mobile enforcement vehicle. This option ensures that financial resources are targeted where required the most (on the main routes) but provides the desired flexibility and an enhanced deterrent factor for the scheme, creating value for money. Financial operational burden can be mitigated through targeted approach with City Centre LEZ only.		Similar design principles could be applied to the enforcement of a Extended Urban Area LEZ to ensure costs are keep to a minimum. However, as air quality improvement are likely to be limited, the value of the scheme may also be limited (see KP1.5).
		Efficiencies in procurement and operation of new enforcement infrastructure can be considered for current projects in respect to CCTV upgrade, Smart Cities programme and bus lane enforcement work. Future proofing the use of the chosen enforcement technology provides valuable investment choice. Mobile enforcement vehicles can be used for a variety of other purposes and are easily re-deployable unlike fixed camera infrastructure.		

Key Principle (KP)	1. City Centre – Original *All vehicle types*	2. City Centre – Revised *All vehicle types*	3. City Centre + Extended Urban Area *City Centre - All vehicles* *Extended Urban Area - HGVs, LGVs, Minibus, Buses & Coaches and Taxis*
KP3.4.4 COVID-19 impact	When approving a scheme Local Authorities and Scottish Minister will need to take account of COVID-19 impacts and their consideration in the design (and possibly operational) phase(s) of LEZ development (Ref. Emerging Transport Scotland LEZ guidance). A review and amendments of the initial (2019) LEZ proposals in Edinburgh has been undertaken, in respect to potential COVID-19 impacts.		
	A two-year grace period is being proposed in-part to account for the economic recovery coming out of the COVID-19 pandemic, for all vehicle types in the City Centre LEZ. This differs to the 2019 proposal which included a 1-year grace period for commercial-type vehicles and 4-years for cars. It should be noted that residents can get up to an additional two years extension to the chosen grace period. This approach also supports the LEZ programme implementation by ensuring sufficient time to develop network management mitigation measures to deal with traffic displacement at the boundary of the City Centre LEZ (See S2 Threats) and encourage modal shift with private car usage (S3).	The Extended Urban Area element of the Edinburgh 2019 scheme proposed a 3-year grace period. This approach was deemed reasonable to allow vehicle owners time to prepare for the LEZ. Should additional time be considered necessary having respect to COVID impacts. the maximum 4-years grace period could be applied; however, they may affect the effectiveness of the scheme due to the fact that enforcement would not begin until 2026.
	The assessment work undertaken for the City Centre LEZ has taken accounted of a post-COVID uncertainties, around travel demand and fleet composition changes (See KP2.4).	The work predominately focused on the city centres of the four major Scottish Cities.

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				Post-COVID-19 impact uncertainty is greater with addition of an Extended Urban Area boundary due to increased scale of scheme. LGV fleet has the highest proportion of non-compliant vehicles (48% compliant in 2020). Increased risk of negative impacts disproportionately felt by microbusinesses/businesses operating across wider area (see IIA KP3.1.2).
	KP3.5 Communications & Engagement	Communications and engagement planning will need to take account of the national strategy and campaigning. Air Quality and health messaging to be priority with communications.		
	KP3.5.1 Scheme complexity	City Centre options lend themselves to clearer communication and engagement with public and stakeholders due to simplicity. Streamlining the complexity of the scheme can be achieved by presenting one grace period for all vehicles included in the LEZ. This differs from the 2019 proposal, where different vehicle types had different grace periods. (Commercial-type vehicles were given one year and cars four years.)		The addition of the Extended Urban Area LEZ, with different vehicle types affected and grace periods, adds a level of complication for public engagement and understanding. Buses, coaches, minibuses, HGVs, LGVs and taxis crossing Extended Urban Area and City Centre boundaries – adds complexity in enforcement and communication of scheme.
	KP3.5.2 Public opinion	An evidence based, targeted air quality intervention with small geographical area, provides a step-change approach to emissions control from the pubic engagement point of view. It builds wider public/stakeholder support for future evidence-backed interventions.		A large geographical area intervention provides less of a step-change approach to emissions control, which might undermine key principles of LEZs.
	KP4.1 Placemaking	The emerging City Plan 2030 (CP2030 will set out the city's spatial strategy to 2030. One of the aims will be to realise the lifelong health benefits of walking and cycling by creating streets and public spaces for people over		

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KP4: Strategic placemaking, sustainable travel	cars and improving and expanding sustainable public transport. It will also be supportive of rationalising freight movement across the city.		
	City Centre options align with following policy choices in Choices for CP2030 which aim to reduce car dominance: • Choice 6 – creating places that focus on people, not cars • Choice 7 – supporting the reduction in car use (focusing on protecting against additional car parking in City Centre, encouraging uptake of P&R facilities) • Choice 8 – delivering new walking and cycling routes (below)		Extended Urban Area boundary addition has limited impact due to the exclusion of cars, against choices 6,7 and 8 in City Plan 2030: • Choice 7 – Extended Urban Area boundary likely to have negligible impact on modal shift away from car use beyond City Centre options, since it only applies to commercial-type vehicles and buses
	Choices for CP2030 (Choice 16) support the provision of city-wide and neighbourhood goods distribution hubs. This policy direction will help to rationalise freight operations and support good placemaking. All LEZ options would benefit from this policy direction.		
	The objectives of Edinburgh's LEZ plans aligns with objectives the Edinburgh City Centre Transformation (ECCT) programme which aim to enhance public spaces to better support life in the city, by prioritising movement on foot, by bike and by public transport.		The Extended Urban Area LEZ aligns less with ECCT due to the geographical differences.
	Decreasing traffic supported by the combination of the Councils strategic plans, with associated cleaner atmosphere in the City may lead to higher quality of public spaces in the City. This could lead to more opportunities for businesses (employment, expenditure, human capital development) as more people are attracted to the City.		
	The LEZ plans will have a complementary benefit to noise control policies. Quieter new (especially alternatively fuelled) vehicles and reduced traffic flows caused by modal shift towards public transport and active travel, are		

Key Principle (KP)		1. City Centre – Original *All vehicle types*	2. City Centre – Revised *All vehicle types*	3. City Centre + Extended Urban Area *City Centre - All vehicles* *Extended Urban Area - HGVs, LGVs, Minibus, Buses & Coaches and Taxis*
		likely to lead to a reduction in inner-city background noise. Lower noise pollution is anticipated to have health and productivity benefits.		
	KP4.2 Mobility & Transport	The Council's newly agreed City Mobility Plan (CMP) supports the implementation of a LEZ in the City. Active travel and integrated transport measures are maximised through the CMP, which can address equality and connectivity issues that may arise from LEZs. In turn, the LEZ principles and objectives support many of the CMP measures and overall direction. The CMP supports the provision of city-wide and neighbourhood goods distribution hubs. This policy direction, supported by a detailed operational plan, will help to rationalise freight operations. All LEZ options would benefit from this policy direction.		
		LEZs should be considered as one part of a range of actions to make our transport system cleaner, greener and healthier. The Edinburgh scheme includes broad high-level objectives (see P1 to S3 below) around issues such as decarbonising transport, road network management, encouraging behaviour change and freight rationalisation. Other area specific transport benefits are highlighted below.		
		A City Centre LEZ, that includes cars, can supporting further development of the public transport infrastructure (including park and ride facilities) that encourages modal shift from the car to more sustainable means of transport. The City Centre LEZ will further contribute to the improvement of infrastructure and facilities (including, but not limited to, cycle lanes, pedestrian pathways and park-and-ride facilities), due to modal shift from car to sustainable travel.		With the addition of the Extended Urban Area LEZ, which includes commercial-type vehicles, there is less support for infrastructure development associated with modal shift from cars to sustainable travel.

Edinburgh Low Emission Zones - Options Appraisal

Key Principle (KP)		1. City Centre – Original *All vehicle types*	2. City Centre – Revised *All vehicle types*	3. City Centre + Extended Urban Area *City Centre - All vehicles* *Extended Urban Area - HGVs, LGVs, Minibus, Buses & Coaches and Taxis*
		The CMP includes demand management measures to restrict traffic growth (e.g. controlled parking zones, explore Workplace Parking Levy etc). Synergies with these measures are more likely with the City Centre LEZ, which addresses all vehicles.		There are less synergies with demand management tools with the addition of the Extended Urban Area boundary as fleet replacement is more likely with HGVs or commercial vehicles as opposed to private cars.
	KP4.3 Climate Change	Decarbonising transport can be achieved through 'system wide', place-centred policies and actions, that focus on changing behaviour, provision of infrastructure to support clean and sustainable travel, and network management such as the implementation of controlled parking zones, and Workplace Parking Levy/'Pay as you Drive' Scheme as needed/subject to consultation. LEZs should also be considered as one part of this system approach.		
		The Council's commitment for Edinburgh to be a net zero carbon city by 2030 and declaration of a Climate Emergency has placed sustainability and climate change at the centre of strategic and policy discussions. This has also raised the profile of Edinburgh as one of the most ambitious cities seeking to tackle climate change to deliver a more sustainable and inclusive city. The LEZ regulations set a mandatory requirement to ensure the scheme contributes towards carbon reduction measures. This is covered in greater detail below (S1).		

Edinburgh Low Emission Zones - Options Appraisal

Objectives

The LEZ regulations oblige local authorities to include two mandatory objectives in their LEZ Scheme that relate to contributing towards meeting the statutory air quality standards (P1) and carbon emission reductions (S1) – see below.

In accordance with the draft LEZ guidance improving local air quality should be considered the primary objective.

The Council has taken on-board guidance to integrate discretionary objectives for the Edinburgh Scheme to ensure successful delivery and operation. These include Network Management (S2) and Behaviour Change (S3) matters.

Primary Objective (P1)	P1. Improve Air Quality (AQ)	*Contribute towards reduction of NOx emissions*
Secondary Objectives (S1, S2, S3)	S1. Reduce Carbon Emissions	*Contribute towards reduction of greenhouse gas emissions*
	S2. Network Management	- *Minimise the impact from traffic displacement across network* - *Complementary/mitigation measures linking with S3 (below)*
	S3. Behaviour Change	*Strategically align with sustainable transport, active travel and placemaking objectives*

Edinburgh Low Emission Zones - Options Appraisal

Appraisal – Primary Objective

P1: Improve Air Quality (AQ) *Contribute towards reduction of NO_X emissions*

SWOT	3. **City Centre – Original** *All vehicle types*	2. **City Centre – Revised** *All vehicle types*	**3. City Centre + Extended Urban Area** *City Centre (All vehicles) +Extended Urban Area (HGVs, LGVs, Minibus, Buses & Coaches and Taxis)*
Strengths	Option 1 will improve air quality over a larger geographical area of the City Centre than the option 2.[1]	Option 2 will improve air quality over a smaller geographical area of the City Centre than the option 1.[1]	Emissions reductions over a wide geographic area
	If option 1 was selected in preference to option 2, there are new exceedances predicted from modelling on the boundary (diversion route) at Chester Street/Palmerston Place in the short-term. However, in the long term (future year scenario) they are not predicted. [1] This is due to less non-compliant traffic now needing to use the diversion route and improvements made with natural fleet turnover.	If Option 2 was selected in preference to Option 1, the impact on Palmerston Place and Chester Street is lower, however existing modelled exceedances are exacerbated on Lothian Road and continue show exceedances in the long term. [1] *See below Weaknesses.*	Displacement of traffic is less of an issue for the Extended Urban Area boundary, as commercial vehicles are more likely to need to upgrade their vehicles in order to continue operations.
	Population exposure to local air pollution can be assumed by considering the residential population of an Area. An analysis utilising data from the Council Address Gazetteer (CAG) was undertaken. The number of residential addresses was considered. Commercial addresses are also included and from a retail survey, shops are identified separately which may give an indication of exposure on the street. Details are shown below/overleaf;		Arterial routes are predominantly affected by this commercial type of vehicular traffic.

[1] *SEPA Air Modelling Interim (April 2021)*

Edinburgh Low Emission Zones - Options Appraisal

<table>
<tr><th>SWOT</th><th>3. City Centre – Original
All vehicle types</th><th>2. City Centre – Revised
All vehicle types</th><th>3. City Centre + Extended Urban Area
City Centre (All vehicles) +Extended Urban Area (HGVs, LGVs, Minibus, Buses & Coaches and Taxis)</th></tr>
<tr><td></td><td>No. of addresses;
<table><tr><td>Residential</td><td>12,536</td></tr><tr><td>Commercial</td><td>4,262</td></tr><tr><td>Shops*</td><td>1,923</td></tr></table>*included in commercial count

The Original City Centre boundary includes a wider geographical area and greater number of residential addresses compared to the Revised boundary.</td><td>No. of addresses;
<table><tr><td>Residential</td><td>11,586</td></tr><tr><td>Commercial</td><td>3,309</td></tr><tr><td>Shops*</td><td>1,732</td></tr></table></td><td></td></tr>
<tr><td>Weaknesses</td><td>Likely significant increase in pollution concentrations and new model exceedances (see Appendix) on boundary/diversion route locations at Palmerston Place and Chester Street. However, the future scenario suggests these new model exceedances are not long term.[1]</td><td>Significantly higher concentrations predicted on Earl Grey Street, Lothian Road, Princes Street (west end), South Charlotte Street, when compared to the option 1, however, these are not new exceedances. There are existing model exceedances, especially on Lothian Road and these are still present in the future scenario. Therefore, they will take longer to resolve.[1]</td><td>Displacement of traffic is less of an issue for the Extended Urban Area boundary, as commercial vehicles are more likely to need to upgrade their vehicles in order to continue operations.</td></tr>
<tr><td></td><td>Model exceedances are also predicted along Cowgate and Abbeyhill, however, concentrations are only slightly higher than Option 2.[1]</td><td>Continued model exceedances are predicted along West Port/South Bridge/Leith Street, although concentrations are only slightly higher than Option 1.[1]</td><td></td></tr>
<tr><td></td><td colspan="2">To the east and south east of the boundary there are also impacts around Queens Drive and Hope Park Terrace.[1] See S2 Network Management mitigation measures.</td><td></td></tr>
<tr><td></td><td colspan="3">The number and types of addresses from CAG (Council Address Gazetteer) were analysed for the streets most impacted from displaced traffic, following implementation of the City Centre LEZ. Details are shown below/overleaf;</td></tr>
</table>

Edinburgh Low Emission Zones - Options Appraisal

<table>
<tr><th>SWOT</th><th colspan="2">3. City Centre – Original
All vehicle types</th><th>2. City Centre – Revised
All vehicle types</th><th>3. City Centre + Extended Urban Area
City Centre (All vehicles) +Extended Urban Area (HGVs, LGVs, Minibus, Buses & Coaches and Taxis)</th></tr>
<tr><td></td><td colspan="2">No of addresses;
<table><tr><th></th><th>Residential</th><th>Commercial</th><th>Shops*</th></tr><tr><td>Palmerston Place</td><td>96</td><td>13</td><td>1</td></tr><tr><td>Chester Street</td><td>67</td><td>13</td><td>0</td></tr><tr><td>Total</td><td>163</td><td>26</td><td>1</td></tr></table>
There are fewer residential and commercial addresses on the streets most affected by the Original boundary, compared to the Revised LEZ boundary.</td><td>No of addresses;
<table><tr><th></th><th>Residential</th><th>Commercial</th><th>Shops*</th></tr><tr><td>Lothian Road</td><td>199</td><td>84</td><td>47</td></tr><tr><td>Queen St /Alybn Pl</td><td>106</td><td>74</td><td>16</td></tr><tr><td>Total</td><td>305</td><td>158</td><td>63</td></tr></table>
For the Revised City Centre boundary the main streets affected are busy urban centres with relatively high levels of residential and commercial properties compared to the Original boundary.</td><td></td></tr>
<tr><td>Opportunities</td><td colspan="2">If Option 2 boundary chosen over Option 1, the boundary could be expanded in the future, ifAQ evidence base supports the need. Also applies to option 1, where boundary could be reduced if necessary.</td><td></td><td>Extended Urban Area boundary unlikely to change since bypass already geographically discrete.</td></tr>
<tr><td></td><td colspan="2">Arterial routes will also see AQ improvements as vehicles travelling to the City Centre become complaint faster than natural turnover of the fleet.</td><td></td><td></td></tr>
<tr><td></td><td colspan="2">Buses are a major contributor to emissions due to their repeat trip nature and high-emitting vehicle. The majority of regular buses on the road network operate in the City Centre LEZ and will therefore be brought up to a complaint standard, across the City.</td><td></td><td>Buses are a factor to air quality issues on arterial routes, however as the majority of buses will upgrade/be retrofitted due to the City Centre LEZ, improvements will be likely, in any case.

Notwithstanding this, if required Traffic Regulation Conditions (TRC) on operator's license could be applied, without cost to infrastructure and operation of Extended Urban Area LEZ.</td></tr>
</table>

SWOT	3. City Centre – Original *All vehicle types*	2. City Centre – Revised *All vehicle types*	**3. City Centre + Extended Urban Area** *City Centre (All vehicles) +Extended Urban Area (HGVs, LGVs, Minibus, Buses & Coaches and Taxis)*
	At the beginning of 2020 the Transport Scotland consulted on the potential for making a transformative shift to zero or ultra-low emission City Centres. This type of policy development could allow for exploration of the future use of the City Centre boundary zone. However, policy and regulations development would be needed.		Extended Urban Area Zero or Ultra Low Emission Zones more difficult to achieve without major national policy change. Cumulative scale of negative impacts could be significant.
Threats *(Mitigation)*	If longer grace periods introduced, scheme effect is limited as the fleet will continue to renew naturally, albeit there is some uncertainty from the impact of the COVIS-19 pandemic (see KP3.4.4.). The emerging LEZ guidance from Transport Scotland says that given that air quality should be improved in the quickest time possible, application of the minimum grace period (i.e. 1 year) should be regarded as the default unless a rationale can be provided to go beyond this. Mitigation - An additional one year is deemed acceptable taking account of the COVID impact. - *Note - Up to two additional years of grace can also be given to residents (see Appendix).*		The wide geographical area and greater impact that is indicated with the Extended Urban Area LEZ, requires longer Grace Periods for sector to prepare. However, if longer grace periods introduced, scheme effect is limited as the fleet will continue to renew naturally, as seen above with the fleet compliance trends (KP1.5). There is added complexity with presenting the scheme with different grace periods between City Centre and Extended Urban Area boundaries, which differ for certain vehicles too.
	Grace periods too short for vehicle owners to prepare for LEZ. The City Centre LEZ includes all vehicles. *Mitigation – a reasonable period of grace should be given taking cognises of COVID-19 impact.*		Considering a longer grace period for the commercial-type vehicles means the effectiveness of the LEZ is less, as vehicles are likely to continue to renew naturally.
	Scheme complexity low in comparison to Option 3, especially if grace periods are aligned for all vehicles. *Mitigation* - *Align Grace Periods for all vehicles*		Scheme complexity high due to the two boundaries, different vehicle types affected with different grace periods. Not able to align Grace Periods as longer grace period needed due to wider impact
	Communications and engagement regarding case for change could be complicated should targeted air quality interventions not be progressed.		Extended Urban Area boundary as a wider intervention, risks delegitimising whole LEZ

SWOT	3. **City Centre – Original** *All vehicle types*	2. **City Centre – Revised** *All vehicle types*	**3. City Centre + Extended Urban Area** *City Centre (All vehicles) +Extended Urban Area (HGVs, LGVs, Minibus, Buses & Coaches and Taxis)*
	Mitigation - *City Centre LEZ boundary progressed as a matter of priority the formal Edinburgh Scheme option*		Scheme, which would have negative effect on progressing the City Centre LEZ, where timely action required. *Mitigation limited*
	Annual monitoring of the LEZ's objectives, can steer further interventions within and outwith City Centre LEZ boundary. *Mitigation* - *Good alignment with the Local Air Quality Management regime to ensure continued improvement in air quality.* - *Ensure a robust monitoring programme in relation to the LEZ objectives*		Annual monitoring of the LEZ's objectives, can steer further interventions across the City. *Mitigation* *-Same to those identified left.* *-The LAQM process is designed to review and assess air quality in the administration and devise an Air Quality Action Plan where exceedances of the Air Quality Objectives are breached or likely to be breached.*
	Emissions controls on buses could be achieved through Traffic Regulation Conditions on bus operator's licenses. However, as other vehicles are required to be addressed in the City Centre, a LEZ-specific route is deemed more appropriate.		Emissions controls on buses could be achieved through Traffic Regulation Conditions (TRCs) on bus operator's licenses, if deemed necessary to control Extended Urban Area emissions in future. This option can be progressed with the Traffic Commissioner, negating the need for specific enforcement system infrastructure. This lessens any risk from reputational damage and low return on investment from high capital cost for underutilised infrastructure., although HGVs and LGVs can not be addressed with TRC process.
	Displacement of traffic around boundaries has potential for AQ increases and/or modelled exceedances. *Mitigation*		See left. Also, as mentioned above, displacement of traffic around the boundary less of a threat in Extended Urban Area LEZ. As only commercial type vehicles affected, it is expected

SWOT	3. **City Centre – Original** *All vehicle types*	2. **City Centre – Revised** *All vehicle types*	**3. City Centre + Extended Urban Area** *City Centre (All vehicles) +Extended Urban Area (HGVs, LGVs, Minibus, Buses & Coaches and Taxis)*
	- A Network Management Strategy will include a number of elements including a signage plan, TRO/restrictions, traffic signals strategy and junction road layout changes. See S2 below *- Continued AQ monitoring around the LEZ boundary and across the City Centre. Potential for development of new real time monitoring site on the boundary itself.*		that the majority of this sector will need to upgrade/renew due to the essential nature of the sector and the deterrent nature of the schemes in Scotland.

Edinburgh Low Emission Zones - Options Appraisal

Appraisal – Secondary Objectives (S)

S1: Reduce carbon emissions *Contribute towards reduction of greenhouse gas emissions*

SWOT	**3. City Centre – Original** *All vehicle types*	2. **City Centre – Revised** *All vehicle types*	**3. City Centre + Extended Urban Area** *City Centre (All vehicles) + Extended Urban Area (HGVs, LGVs, Minibus, Buses & Coaches and Taxis)*
Strengths	The LEZ scheme as a whole supports the local authority's desire to achieve net-zero carbon.		
	Interventions that reduce local air pollution (NO2 and PM2.5/PM10) are also likely generate a positive effect on reducing factors contributing to climate change through reduced greenhouse gas emissions (measured in CO2 equivalent tonnes).		
	Modal shift from fossil-fuelled vehicles to zero emission (and active) travel will achieve the most significant carbon reductions. Although not a strict requirement of the LEZ schemes in Scotland, the Council will continue to promote and encourage this type of shift by aligning the LEZ principles with the CMP.		
	The City Centre LEZ supports modal shift objectives due to the fact that cars are included in the scheme. The support grants for people to dispose of non-compliant cars, also offers Travel Better vouchers, which provides financial benefit to encourage the transition from the private car to more sustainable forms of transport (modal shift) to certain sectors of society.		With addition of the Extended Urban Area boundary modal shift is less supported as cars are not included in the boundary.
Weaknesses	The regulations set minimum petrol and diesel vehicle emission standards for the LEZs - Euro 4 Petrol and Euro 6/VI – because the primary objective is to improve local air quality. Carbon reduction is a limited secondary benefit as fossil-fuels continued to be allowed.		
	Encouraging wide uptake of fossil-fuelled LEZ compliant vehicles has some medium-term implications in working towards net-zero carbon targets for 2030, due to the fuel type minimum standards.		
Opportunities	Future management of vehicles based on zero emissions is an opportunity. See P1 above. Emission standards could be improved through changes to regulations in the future.		Due to the large geographical area, the feasibility of a potential zero emissions zone is low.
Threats (Mitigation)	Limited reduction of carbon related emissions, with non-fossil-fuelled vehicles not specifically encouraged. *Mitigation – LEZ must be considered as part of 'system wide' place-centred policies and actions to decarbonise transport, that focus on demand and behaviour first, including programmes to support a shift to sustainable modes of travel such as spaces for people (and other road space reprioritisation plans).*		

S2: Network Management *Minimise the impact from traffic displacement across network*

SWOT	3. **City Centre – Original** *All vehicle types*	2. **City Centre – Revised** *All vehicle types*	**3. City Centre + Extended Urban Area** *City Centre (All vehicles) + Extended Urban Area (HGVs, LGVs, Minibus, Buses & Coaches and Taxis)*
Strengths	A major consideration of a LEZ scheme is to allow a diversion route around the LEZ to provide motorists with instructions on how to avoid the LEZ. Diversion signs should be considered as an essential requirement. This will form one aspect of a Network Management plan brought forward to manage the impact of the LEZ on traffic.		
	Development of a network Management Strategy will also incorporate Traffic Regulations Order considerations, traffic signals strategy and any changes that might be necessary to junctions or road layout, without necessarily creating additional demand in the network.		Diversions around the Extended Urban Area boundary is less of a consideration, as commercial type vehicles are more likely to need to upgrade their vehicles in order to continue operations.
	There is potential to facilitate strategic transport and public realm infrastructure projects to complement LEZ implementation. Especially with regard to the City Centre Transformation programme.		
Weaknesses	Increases in traffic at boundary in the compared to no LEZ scenario; • West End: 19–50%; Palmerston Place, 9–22% Chester Street. • East End: 15-20% Abbeyhill; 5-10% London Road	Increases in traffic at boundary, when compared with Option 1; • Charlotte Square/North/South Street • Lothian Road • Earl Grey Street. This could have a negative impact on the strategic CCWEL Active Travel infrastructure project.	
Opportunities	Support prioritisation of strategic transport and public realm infrastructure improvement project at Toll Cross (both boundary options).		Limited ability to support Extended Urban Area infrastructure projects.
Threats (Mitigation)	Low risk of buses and coaches not upgrading/renewing vehicles and turnaround at LEZ boundary. *Mitigation – major bus company, Lothian Buses already committed 100% LEZ compliant standards by end of 2021.* Opportunity to align bus network review (CMP). *Continue to work*		

SWOT	**3. City Centre – Original** *All vehicle types*	2. **City Centre – Revised** *All vehicle types*	**3. City Centre + Extended Urban Area** *City Centre (All vehicles) + Extended Urban Area (HGVs, LGVs, Minibus, Buses & Coaches and Taxis)*
	with bus stakeholders, SEPA and Transport Scotland to consider if any further regulation would be necessary (potential TRC) (see P1 Threats).		
	Traffic displacement on the road network boundary. *Mitigation* - *Mitigation measure will be brought forward through the network management strategy and may include junction reconfiguration (Toll cross, Pleasance/Holyrood/St Mary's Street), road changes (two way on Morrison Street, removal of parking bays (Palmerston Place), optimised signal staging (Palmerston Place/Chester Street, Easter Road/Abbey mount, Abbeyhill), improved signing, overnight lorry ban (Great Stuart Street/Ainslie Place) and rationalisation of pedestrian crossings or link to Urban Traffic Control (Pleasance).* - *Junction improvements are already being developed for Drumsheugh Gardens / Lynedoch Place / Randolph Crescent and Lothian Road. These need to be reviewed to ensure LEZ demand is accommodated.* - *A robust monitoring regime will also form part of the network management strategy and may cover public transport journey times, traffic surveys and public opinion surveys.*		
	Specific impacts caused by option 1: • Increase in traffic demand on Palmerston Place and Chester Street	Specific impacts caused by option 2: • Conflicts with the CCWEL active travel corridor on South Charlotte Street due to increase traffic demand	
	Higher risk of network management mitigation measures not being developed in time, due to the likelihood of Traffic Regulation Orders being required for the Original boundary. *Mitigation: A longer grace period would support implementation of the required measures (see also P1 Threats)*	The Revised boundary follows the main City Centre trafficked route of Lothian Road to Queen Street, therefore the mitigation measures required to implement the boundary are not as significant as the Original boundary.	

S3: Behaviour Change *Strategically align with sustainable transport, active travel and placemaking objectives*

SWOT	**3. City Centre – Original** *All vehicle types*	2. **City Centre – Revised** *All vehicle types*	**3. City Centre + Extended Urban Area** *City Centre (All vehicles) + Extended Urban Area (HGVs, LGVs, Minibus, Buses & Coaches and Taxis)*

Strengths	Support and complement other strategic transport and placemaking projects in the City Centre areas, at or near to the boundary or within the LEZ. Such projects include;
	• Edinburgh City Centre Transformation (ECCT) and other strategic projects:
	  ○ Meadows to George Street
	  ○ City Centre East-West Link
	  ○ Princes Street/Waverley Bridge
	  ○ Cockburn Street/Victoria Street/High Street
	  ○ Lothian Road
	• Spaces for People
	• Trams to Newhaven
	• Controlled Parking Zone (CPZ) review
			A Extended Urban Area LEZ including commercial-type vehicles could support the development of a comprehensive city freight and servicing operations system planned, including neighbourhood delivery hubs. Some consideration would need to be given to the timing of implementation.

	The benefits and learnings from the Spaces for People programme introduced in 2020/21 been considered within the LEZ scheme as part of a green recovery transformation, especially where they can be complemented around the boundary areas.		
	The LEZ will encourage a modal shift from cars to public transport and active travel. This will result in public health, air quality improvements, as well as benefitting the health of individuals from increased activity levels.		
	Low Emission Support Fund encouraging modal shift though financial benefit received for disposal of non-compliant car or vehicle and change to more sustainable transport - Travel Better vouchers. This includes money towards a bike, e-bike or public transport. See S1 Strength.		Inclusion of buses/commercial type vehicles does not nudge towards positive modal shift. Therefore, added benefit of Extended Urban Area boundary in terms of modal shift is considered low.
	Any reduction in vehicles within the boundary may improve access to services for those travelling by modes other than private car, including public transport or active travel. This would make sustainable forms of transport more attractive.		

Edinburgh Low Emission Zones - Options Appraisal

SWOT	**3. City Centre – Original** *All vehicle types*	2. **City Centre – Revised** *All vehicle types*	**3. City Centre + Extended Urban Area** *City Centre (All vehicles) + Extended Urban Area (HGVs, LGVs, Minibus, Buses & Coaches and Taxis)*
	There is more scope for Option 1 to encourage behaviour change (vehicle upgrades/renewal or modal shift) as it covers a wider geographic area with more complex diversion route.	Option 2 diversion route is a key City Centre road, which if used as a boundary is less likely to incentivise behavioural change in terms of fleet upgrade/renewal, or modal shift.	
Weaknesses	None identified		Extended Urban Area boundary has limited positive knock on behaviour change impacts: • e.g. P&R is not necessarily encouraged since Extended Urban Area boundary does not include cars
Opportunities	Complement future behavioural change strategies and plans including; • Workplace Parking Levy • 20-minute neighbourhoods		
Threats (Mitigation)	Communications needs to be clear that LEZ forms part of a 'system wide' place-centred strategy to decarbonise transport, that focus on demand and behaviour change. *Mitigations* - *An effective communication campaign shall include the system wide changes that are needed to support LEZ and encourage a decarbonised transport structure fit for the future.*		

Edinburgh Low Emission Zones - Options Appraisal

Appendix

Acronyms, terms and definitions

Term/Acronym	Definition
AQAP	Air Quality Action Plan - Every local authority that has an active Air Quality Management Area (AQMA), is required under Part IV of the Environment Act 1995 to provide an Air Quality Action Plan (AQAP) as a means to address the areas of poor air quality.
AQMA	Air Quality Management Area - Air Quality Management Areas (AQMAs) are declared when there is an exceedance or likely exceedance of an air quality objective (AQO).
AQO	Air Quality Objectives Statutory
ANPR camera	Automatic Number Plate Recognition camera
Emission Standards	Mandatory nationally consistent emission standards for Scottish LEZs have been set for virtually all petrol and diesel vehicle classifications (e.g. buses, taxis, vans, HGVs, cars, motorcycles) within the Low Emission Zones (Emission Standards, Exemptions and Enforcement) (Scotland) Regulations 2021.
Euro Standards	The Euro standards are defined in a set of European Union directives and provide a list of acceptable limits for exhaust emissions of all new vehicles that are sold in the EU. They cover oxides of nitrogen (NOX), hydrocarbons (HC), carbon monoxide (CO) and particulate matter (PM) emissions. The Euro emission standards are based on Nitrogen Dioxide emissions, and use Arabic (Euro 5, Euro 6 for cars) and Roman (Euro V, Euro VI for heavy-duty vehicles) numbering to classify the emission standard (Holman et al 201520).
Grace Period	The purpose of a grace period is to provide the registered keeper of the vehicle with time to prepare and plan ahead before a LEZ enforcement regime starts, so that their vehicle or vehicles are compliant with the LEZ emission standards, or they are able to source an alternative mode of travel into the LEZ. A grace period applies to both individuals who are: • Non-residents – individuals whose registered address is not within the zone. This categorisation applies to both residents and businesses. Essentially, this element covers all registered keepers of vehicles • Residents – individuals whose registered address in respect of the vehicle is a residential property within the zone A grace period begins 'on the day the LEZ comes into effect' and means that emission standards are not contravened until the grace period has expired.
HGV	Heavy Goods Vehicle
LAQM	Local Air Quality Management Regime as defined by the Environment Act 1995
LGV	Light Goods Vehicle
Local time-limited exemptions	Exemptions which can be applied at the discretion of local authorities to individual LEZs, to cover any vehicle type that is not covered by the national exemption. Different LEZs could have different local time-limited exemptions.

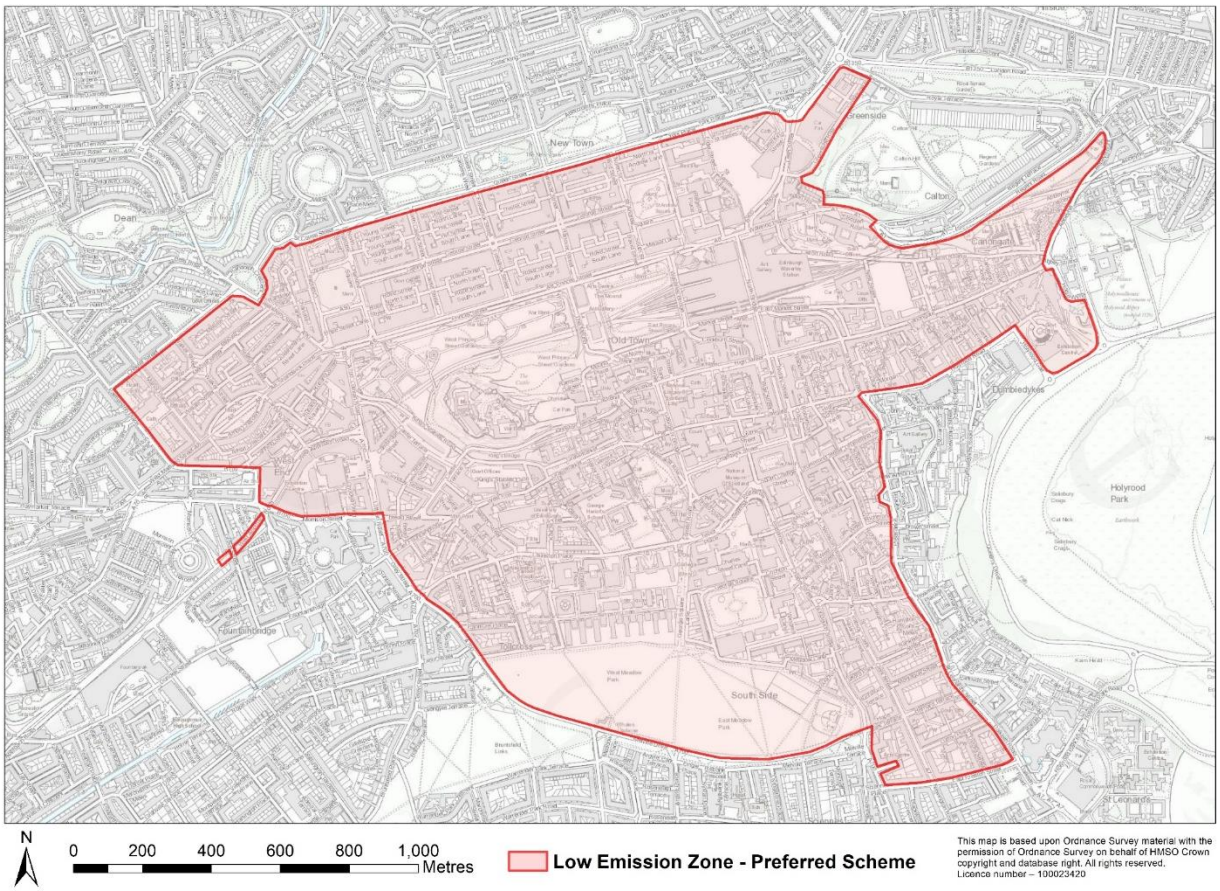
Term/Acronym	Definition
National exemptions	Exemptions which apply consistently across all Scottish LEZs, as set out in Regulations. Local Authorities must apply these exemptions to their LEZ at all times; they cannot be revoked.
New modelled exceedance	The NMF modelling work predicts future concentrations of 40ug/m-3 annual mean (NO2) at the roadside, which has not been predicted in the baseline scenario. *Note* the location assessment differs to that required for assessment of statutory Air Quality Objectives, where is in necessary to consider 'relevant receptors'.
NMF	National Modelling Framework
NLEF	National Low Emission Framework
MOVA	Microprocessor Optimised Vehicle Actuation (MOVA) – traffic management system.
TRCs	Traffic Regulation Condition – On licenses for buses there is The Public Service Vehicles (Traffic Regulation Conditions) Amendment (Scotland) Regulations 2008 which allow for emission standards to be put in place.

Appendix 4

Preferred Low Emission Zone Scheme Details

Zone Boundary

The Low Emission Zone is shown below. Further detail is outlined in Annex A.



The area totals 3.1km^2 (1.2 square miles) with a perimeter of 10.7 km (6.6 miles).

The perimeter of the Scheme lies adjacent to various roads, which are excluded from the scope of the Scheme itself. A list of roads excluded from the Scheme, but which form the boundary are listed, by city area:

- *North-east:* Queens Street, York Place, Regent Road east of roundabout at St Andrew's House, Abbeymount, Abbeyhill, Horse Wynd, Queen's Drive, Holyrood Gait, Holyrood Road, Pleasance
- *South-east:* Pleasance, St Leonard's Street, Dalkeith Road, East Preston Street, West Preston Street, Summerhall Place, Summerhall Square, Summerhall Crescent, Melville Drive
- *South-west:* Melville Drive, Brougham Place, Brougham Street, Earl Grey Street, Lothian Road, north of junction with Bread/Morrison Street; West Approach Road west of junction with Morrison Link; Morrison Street, Dewar Place, Torphichen Street.
- *North-west:* Palmerston Place, Chester Street, Drumsheugh Gardens, Randolph Crescent, Great Stuart Street, Ainslie Place, St Colme Street

Appendix 4

The following roads are partly within the Scheme boundary;

- *North-east:* Regent Road, west of roundabout at St Andrew's House
- *South-west:* Lothian Road, south of junction with Bread/Morrison Street; West Approach Road, east of junction with Morrison Link; Queensferry Street, east of junction with Randolph Crescent

Start Date

The Scheme will come into effect by 31st May 2022. A grace period will commence from this date and enforcement will not begin until the grace period comes to an end.

Grace Period

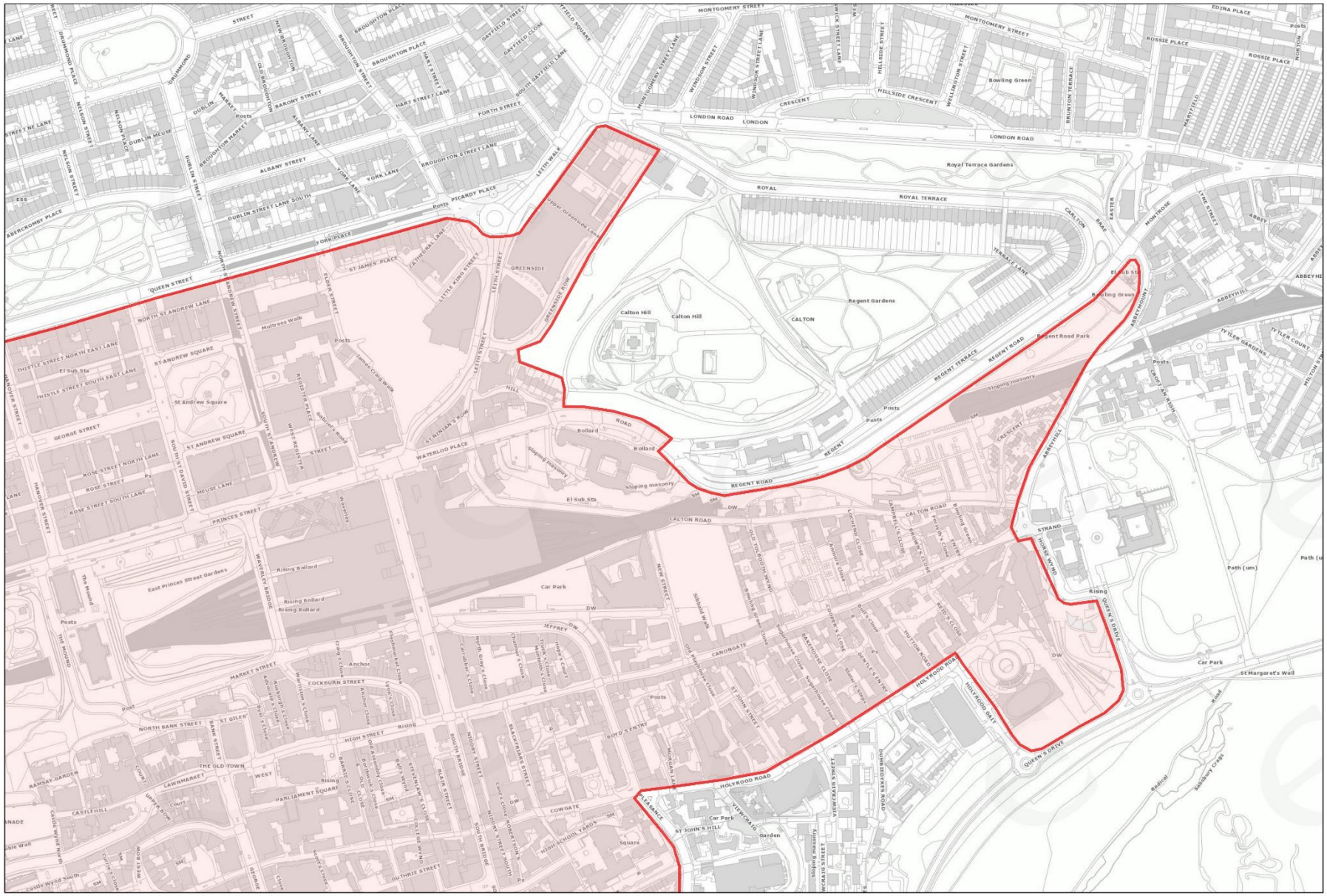
A grace period of 2 years will begin on the start date and will apply to all vehicle types included in the Scheme. Enforcement will therefore commence by 1st June 2024.

Vehicle Types Included

The scope of Scheme will apply to all vehicle types except motorcycles and mopeds. The vehicles included are; cars (light passenger vehicles), minibuses, buses, coaches, light goods vehicles and heavy goods vehicles.

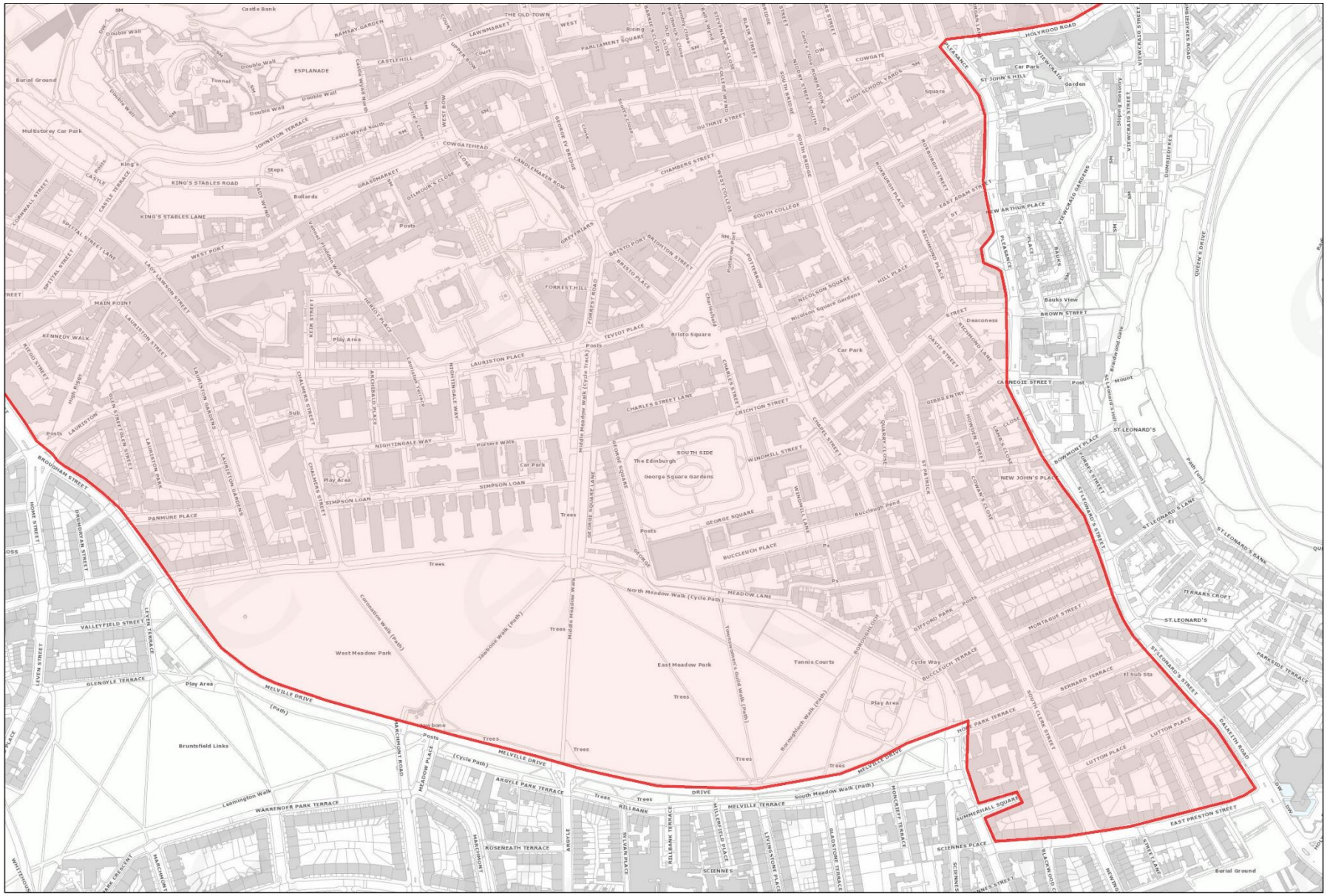
Annex A

Detailed Boundary – North East



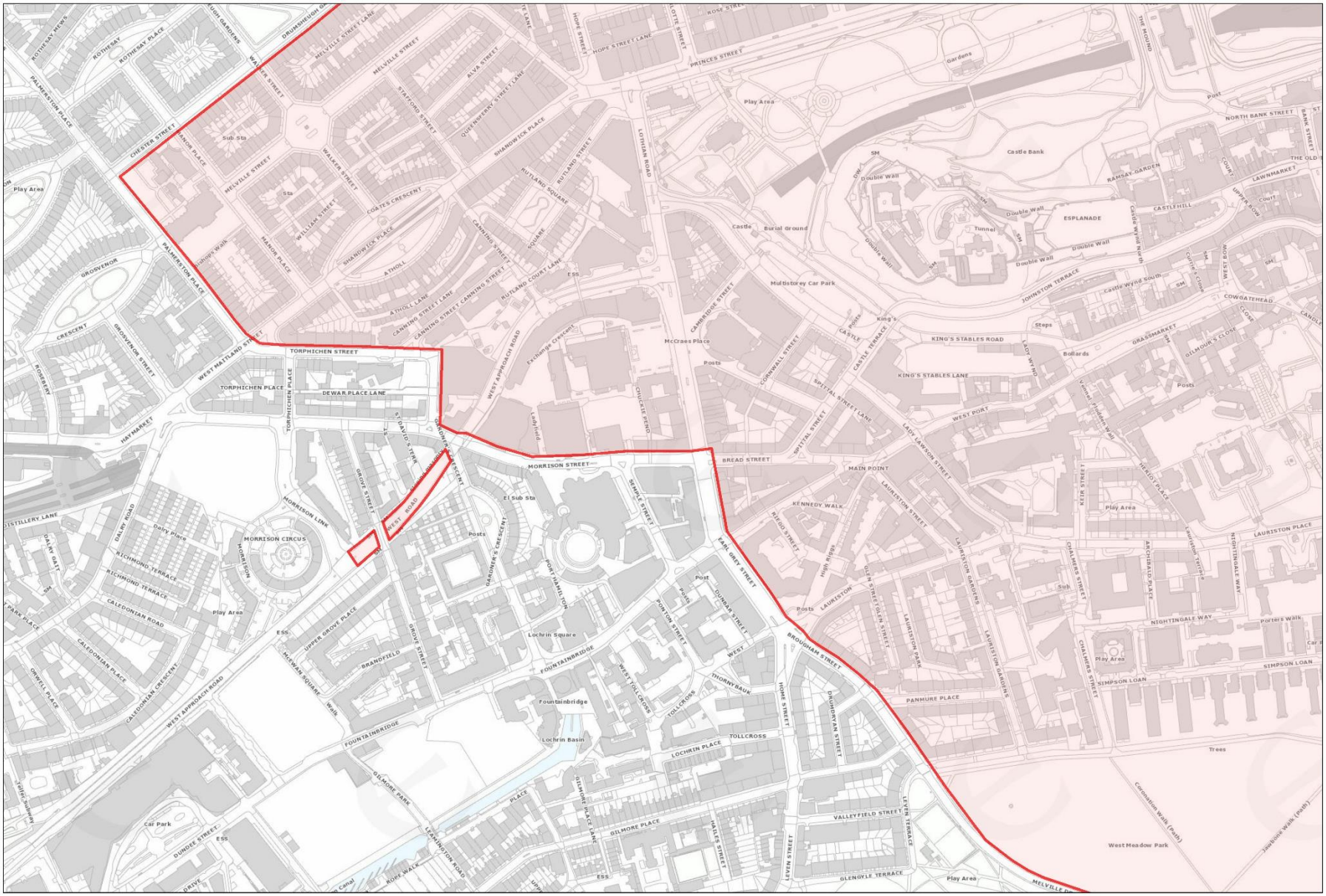
Appendix 4

Detailed Boundary – South East



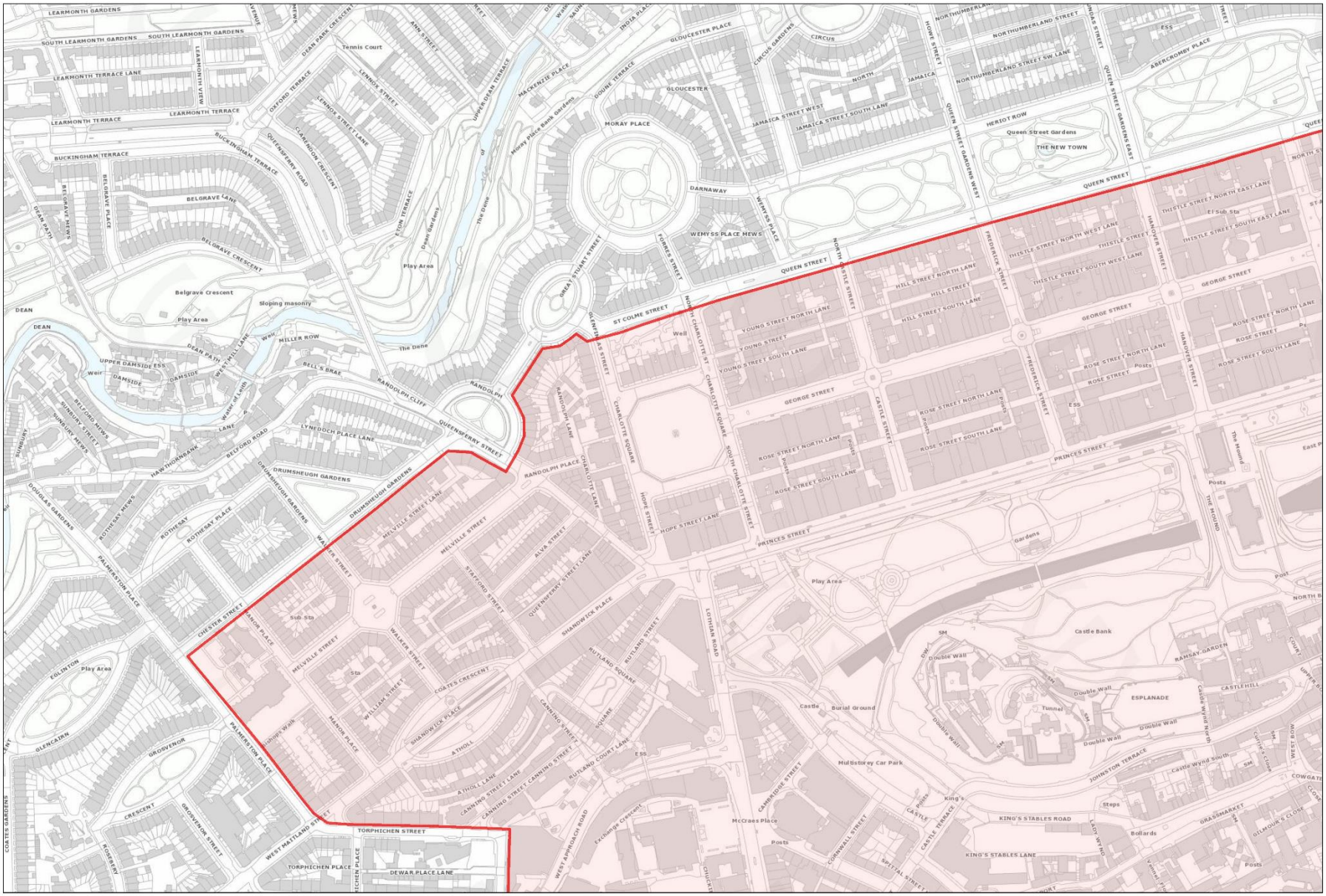
Appendix 4

Detailed Boundary – South West



Appendix 4

Detailed Boundary – North West



Edinburgh Low Emission Zone

The City of Edinburgh Council

Revised Fleet Composition, Transport Modelling Report

22 February 2021

Edinburgh Low Emission Zone

Project No:	B2340202
Document Title:	Revised Fleet Composition, Transport Modelling Report
Document No.:	1
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Client No:	
Project Manager:	G Davidson
Author:	L Bacon / G Davidson
File Name:	C:\B3000000 LEZ\Report\Modelling\LEZ Modelling Report 150321.docx

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Document history and status

Revision	Date	Description	By	Review	Approved
1	27.07.20	Draft Report	LB	GD	GD
2	22.02.21	Final Draft Report incorporating CEC comments	LB	GD	GD
3	15.03.21	Final Report	LB	GD	GD

Contents

1. Introduction

1.1 Introduction

This report summarises the traffic modelling undertaken to assess the impact of the Low Emission Zone (LEZ) proposed for Edinburgh city centre.

All modelling has been undertaken in VISUM 18. Base models are those previously created in support of the Edinburgh Tram Final Business case and were last recalibrated in spring 2017. Highway demands make use of November 2016 traffic count data collected on behalf of SEPA.

1.2 Report Structure

The report structure is as follows:

- Chapter 1 – Introduction
- Chapter 2 – Modelling assumptions
- Chapter 3 – Model development
- Chapter 4 - City Centre Transformation
- Chapter 4 – Results
- Chapter 5 – Summary

1.3 Scenarios

Four alternative scenarios have been considered:

- Base
- Original LEZ
- Original LEZ + City Centre Transformation schemes
- Revised LEZ + City Centre Transformation schemes

1.4 LEZ Boundaries

The proposed LEZ boundary has been developed based on a detailed understanding of the air quality issues in Edinburgh from the air quality model. In addition, a key consideration has been the need to provide a clear, logical, and readily signposted diversion route for non-compliant vehicles.

To the north, Queen Street is proposed to be excluded from the LEZ as it provides a suitable alternative route. If Queen Street were included this would encourage additional traffic through Stockbridge (via Hamilton Place / Henderson Row and Brandon Street / Eyre Place). Ferry Road as a further alternative was considered too far from the city centre.

The proposed eastern boundary of the LEZ is defined by Abbeyhill, Holyrood Road, Pleasance and St Leonard's Street. These all lie outside areas with high pollutant concentrations area and provide a suitable diversion. Queen's Drive is not an acceptable diversion as it is closed to general traffic on a Sunday (and at all times for some vehicles).

The proposed western LEZ boundary is complex to define and runs along Earl Grey Street, Morrison Street, West Approach Road and Torphichen Street. Including Haymarket within the zone would result in non-compliant traffic routing via Murieston Place / Murieston Crescent / Russell Road – these narrow residential streets are not a suitable alternative. The next possible boundary would be at Hutchison Crossway / Balgreen Road and was considered to extend too far into the west.

The proposed southern boundary utilises East and West Preston Street and Melville Drive. This provides a relatively straightforward diversion, avoiding the city centre.

The above LEZ boundary area is illustrated in Figure 1.1.

An alternative boundary has also been tested, as shown in Figure 1.2. This is unchanged from Figure 1.1 along the north, east and southern boundaries but the western boundary is revised to be via Lothian Road and South and North Charlotte Street. Although much of the West End lies outside the LEZ area in this option, non-compliant traffic is reduced on a number of key streets including Palmerston Place, Chester Street, Randolph Crescent and Great Stuart Street.

Figure 1.1: Original LEZ boundary

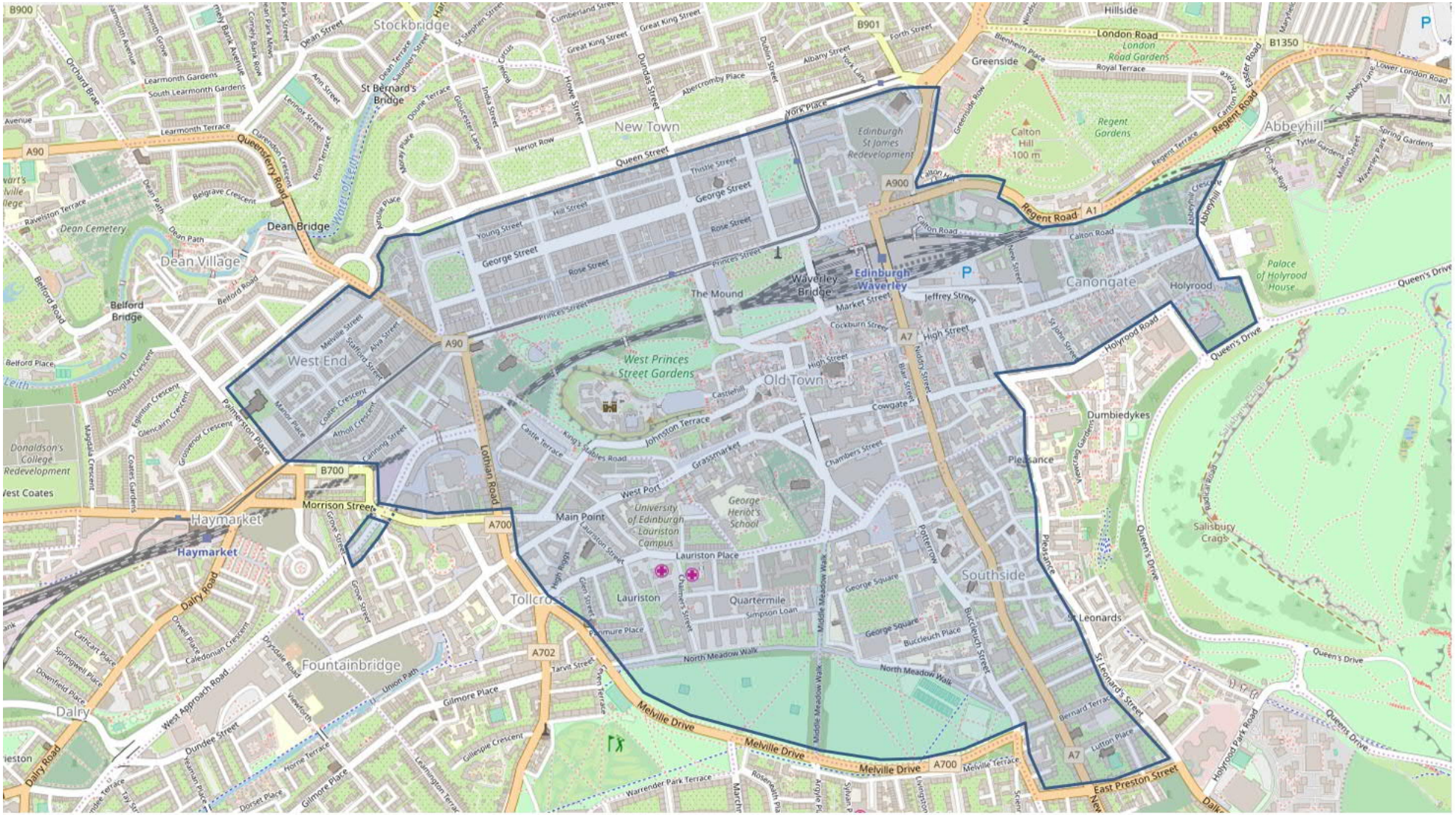
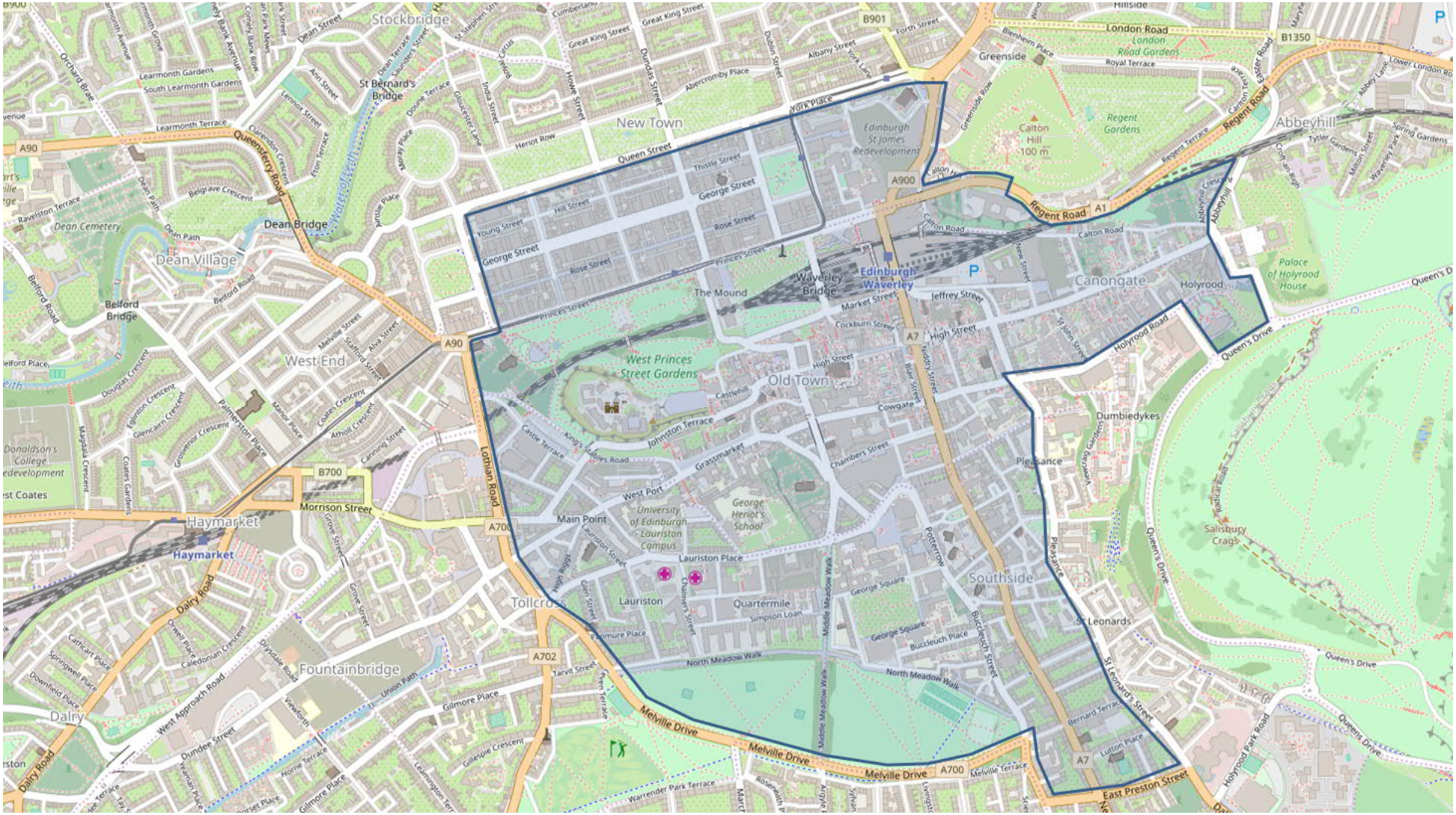


Figure 1.2: Alternative LEZ boundary



2. Model Parameters

2.1 Model Years

Two forecast years have been assessed – 2019 and 2023. Both use 2016 VISUM flows, as agreed with SEPA, so that any change in assignment is a result of changes in fleet mix rather underlying travel patterns. Having only a limited number of variables enables the impact of the LEZ and changes in fleet mix to be better understood.

In summary, model tests are:

- 2019 base year: 2016 traffic volumes and 2019 fleet mix
- 2023 forecast year: 2016 traffic volumes and 2023 fleet mix

It should be noted that the applied future year fleet mix is an estimate, based on available SEPA / Department for Transport data. Fleet forecasts tend to be optimistic and so the 2023 model represents a likely 'future year', post 2023.

2.2 Model Segmentation

Car matrices have been disaggregated to differentiate between petrol and diesel engine types in order that the SEPA model can more accurately calculate emissions by compliant and non-compliant traffic. Given limited data, the disaggregation is based on an agreed global split with no further spatial differentiation.

2.3 Petrol / Diesel Split

The agreed disaggregation between petrol and diesel engine types is given in Table 2.1 below. 2019 Values are from the recent Edinburgh ANPR survey.

Table 2.1: Petrol / Diesel Split

	2019 compliant	2019 non-compliant	2023 compliant	2023 non-compliant
Cars (Diesel)	42.6	57.4	78.1	21.9
Cars (Petrol)	88.4	11.6	99.6	0.4
LGVs	41.2	58.8	81.6	18.4
HGVs	64.4	35.6	91.6	8.4

2.4 Fleet Composition

The base year fleet composition has been updated from previous work, based on summer 2019 ANPR data. The key difference between 2016 and 2019 data is a much higher level of observed LGV compliance.

Proposed 2019 and 2023 values are summarised in Table 2.2.

Table 2.2: Fleet Composition

Car	2019	2023
Diesel Compliant	42.6	78.1
Diesel Non-compliant	57.4	21.9
Petrol Compliant	88.4	99.6
Petrol Non-compliant	11.6	0.4
LGV	**2019**	**2023**
Compliant	41.2	81.6
Non-compliant	58.8	18.4
HGV	**2019**	**2023**
Compliant	64.4	91.6
Non-compliant	35.6	8.4
Buses	**2019**	**2023**
Euro 6	52.0	83.9
Non-compliant	48.0	16.1
Taxi	**2019**	**2023**
Euro 6	43.6	100.0
Non-compliant	56.4	

2.5 Compliance Assumptions

All vehicles with an origin or destination within the city centre are assumed to be compliant with LEZ legislation. In addition, non-compliant vehicles which would previously have routed through the city centre now route around the LEZ boundary.

Virtually no non-compliant vehicles are assumed to cross the boundary. In part, this is a model simplification; however, it also reflects the high cost of the proposed penalty charge which is intended to be prohibitive to almost all drivers.

Table 2.3: Compliance Assumptions

Vehicle Type	Modelled Assumption
Car	100% Car switch from non-compliant to compliant for origin and destination zones within the LEZ
LGV	100% LGV switch from non-compliant to compliant for origin and destination zones within the LEZ
HGV	100% HGV switch from non-compliant to compliant for origin and destination zones within the LEZ

Buses are coded as fixed routes in the model and are assumed to be 100% compliant within the city centre.

Separate compliant and non-compliant vehicle matrices have been created for each vehicle type.

3. City Centre Transformation Impacts

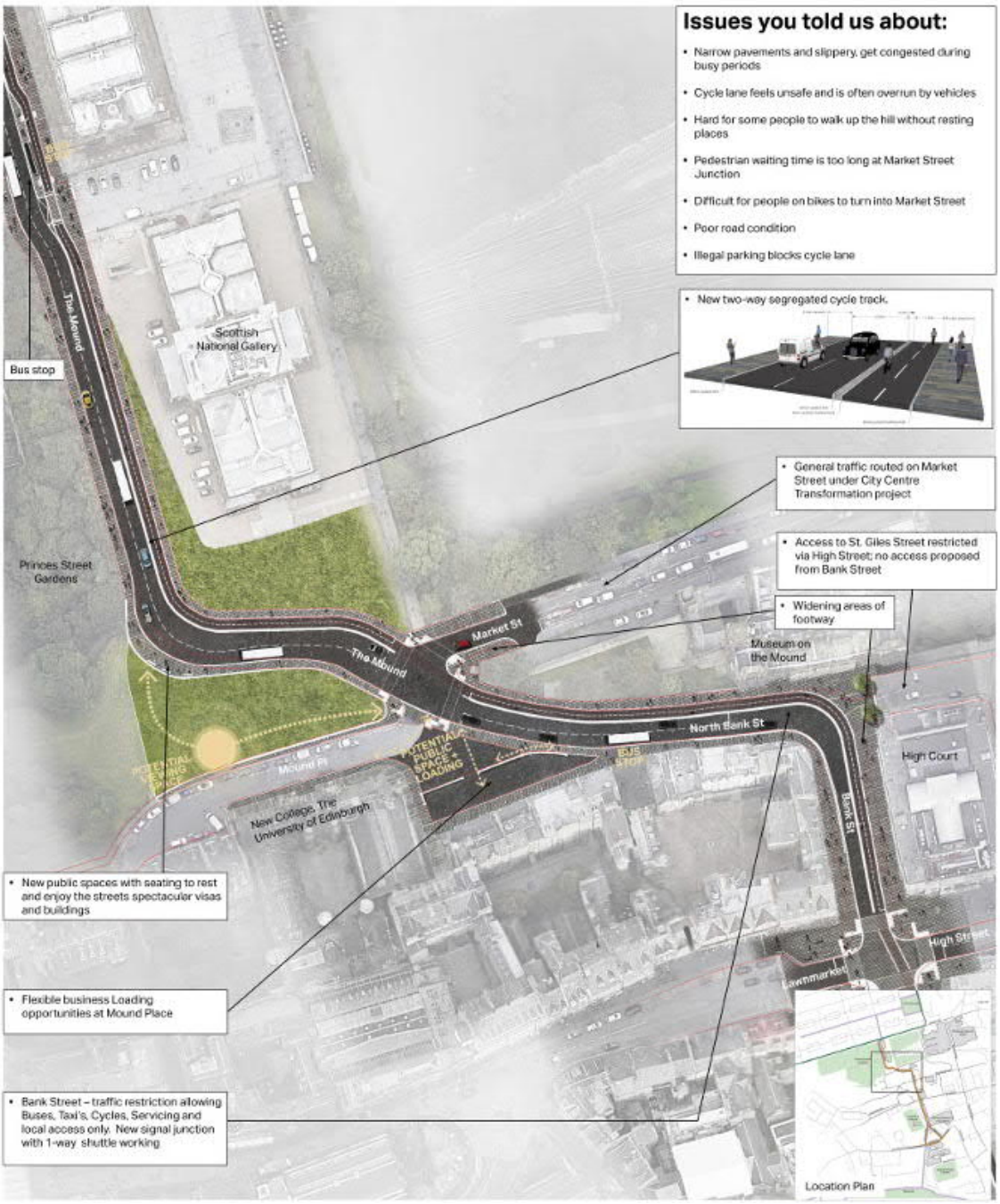
3.1 Introduction

Edinburgh City Centre Transformation (ECCT) proposals, due to be implemented by or shortly after implementation of the LEZ, have been captured in the revised modelling. Key scheme changes are summarised below.

3.2 Meadows to George Street

The Meadows to George Street scheme is included within forecast years. An indicative layout is given in Figure 3.1; it includes a bus / taxi gate on Bank Street and the closure of Forrest Road to all traffic except cycles.

Figure 3.1: Meadows to George Street Scheme (including Bank Street bus / taxi gate)



Improvements (single lane approaches on each arm) are proposed at the George Street / Hanover Street junction supporting the George Street public realm scheme.

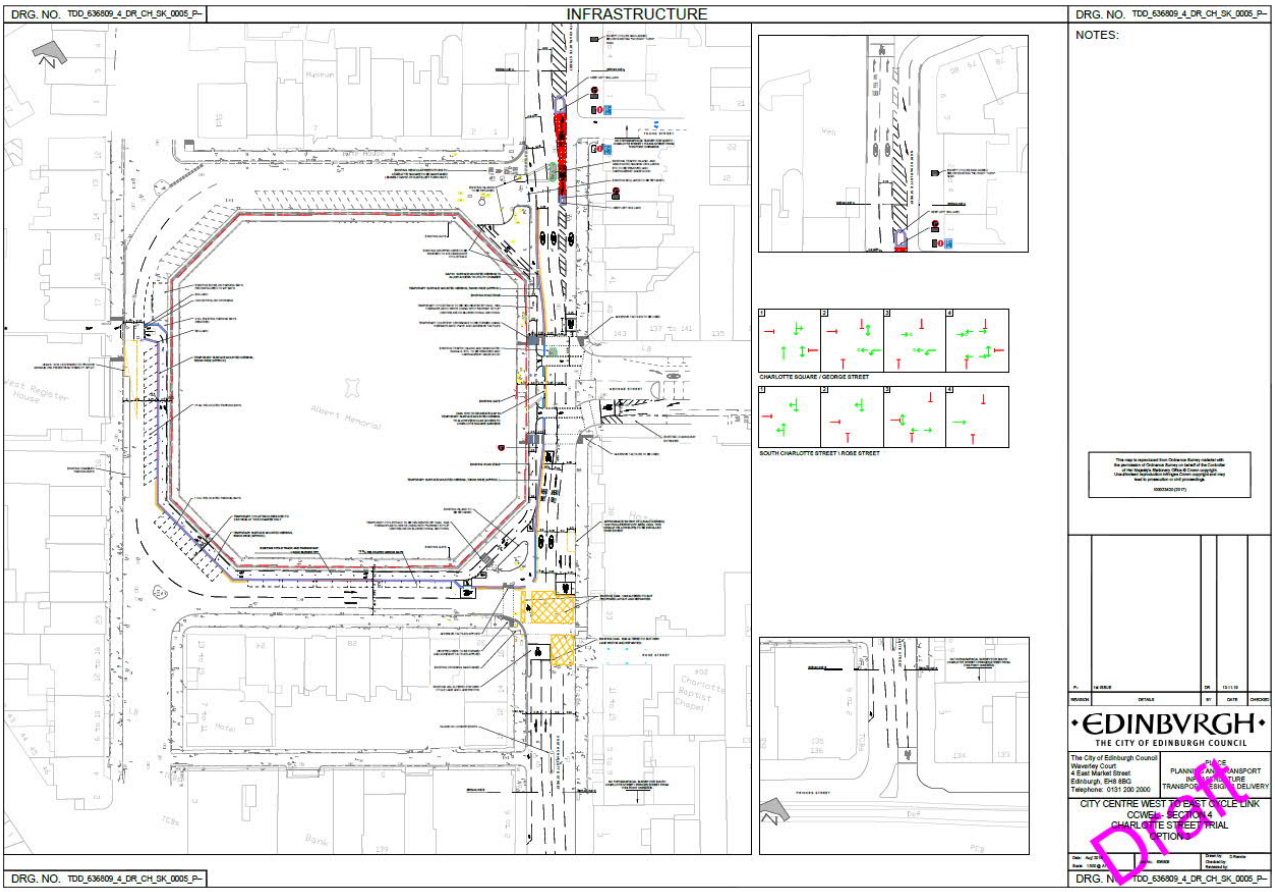
In addition, the Meadow to George Street proposal now includes the closure of Market Street to through traffic (access to the station is maintained) and this change is included within the ECCT model scenario.

3.3 CCWEL Charlotte Street Trial

The City Centre West to East Link creates a new safe, direct cycle route from Roseburn to York Place.

At Charlotte Square, a trial is proposed, reducing the number of southbound lanes from two to one, as shown in Figure 3.2. This restriction is on the route of the alternative LEZ boundary and so the impact will be tested with both boundary scenarios.

Figure 3.2: Charlotte Street Trial Layout

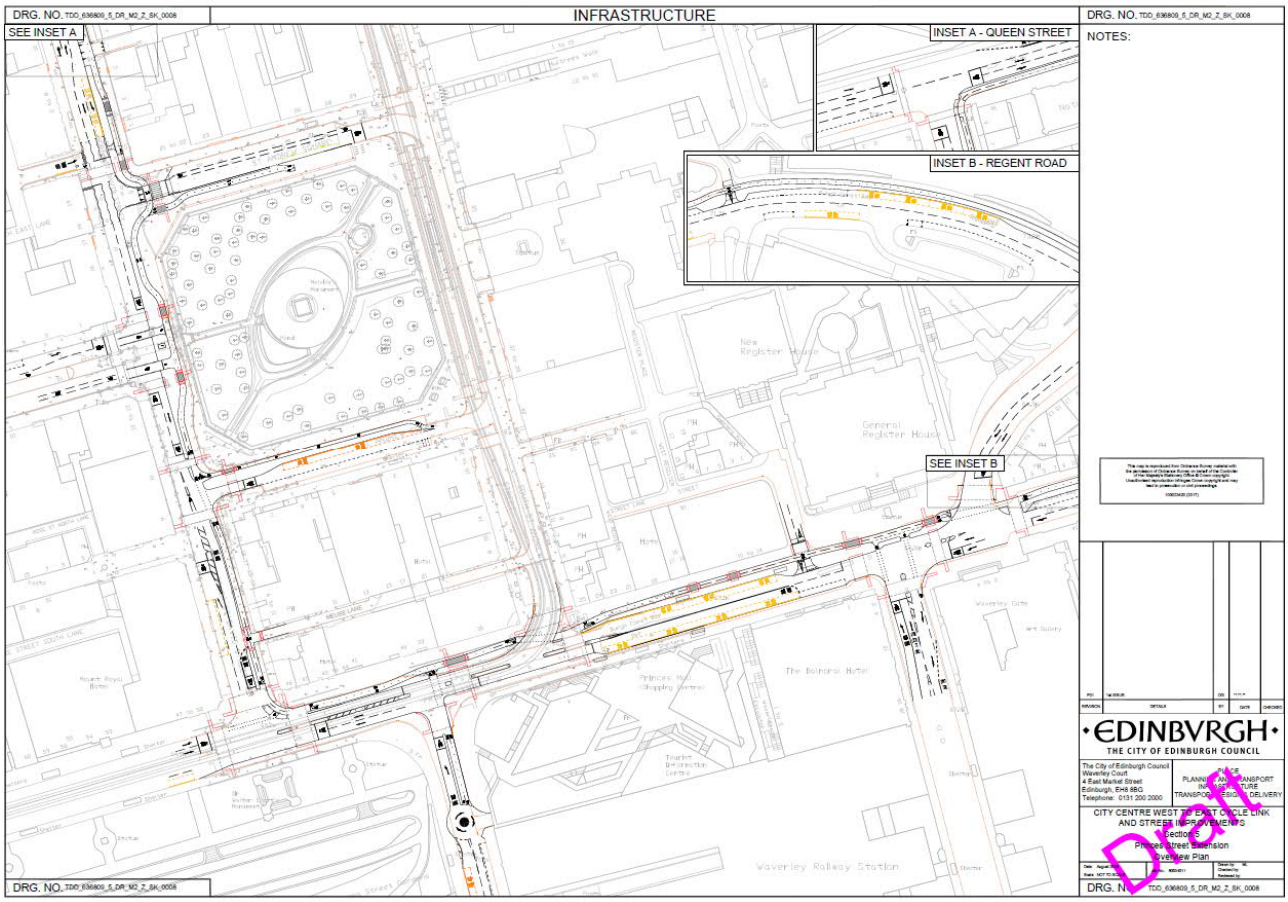


3.4 East End of Princes Street / Waverley Bridge

An experimental closure of the East End of Princes Street to general traffic and the full closure of Waverley Bridge has being implemented over summer 2020. This provides an improved pedestrian environment, more reliable public transport journey times and helps support construction work at York Place.

In the medium term, a permanent solution is proposed, similar to the layout shown in Figure 3.3.

Figure 3.3: Princes St East Trial Layout



East Princes Street / Waverley Bridge traffic management is included within the modelled package of ECCT measures. This scheme, and the Meadows to George Street closure, displaces traffic to Picardy Place, which is already close to capacity. A key output from the modelling will be to understand what further impact the LEZ scheme has in terms of the operation of this junction above other ECCT impacts.

3.5 Cockburn Street / Victoria Street / High Street

Cockburn Street and Victoria Street are assumed to be closed under ECCT proposals. In practice, local access for deliveries is permitted between 06:30 and 10:30, similar to High Street restrictions.

An additional closure is included on the High St, west of the Jeffrey Street / St Mary's Street junction. Again, local delivery access will be maintained.

Figure 3.4: ECCT Key North / South Capacity Reductions

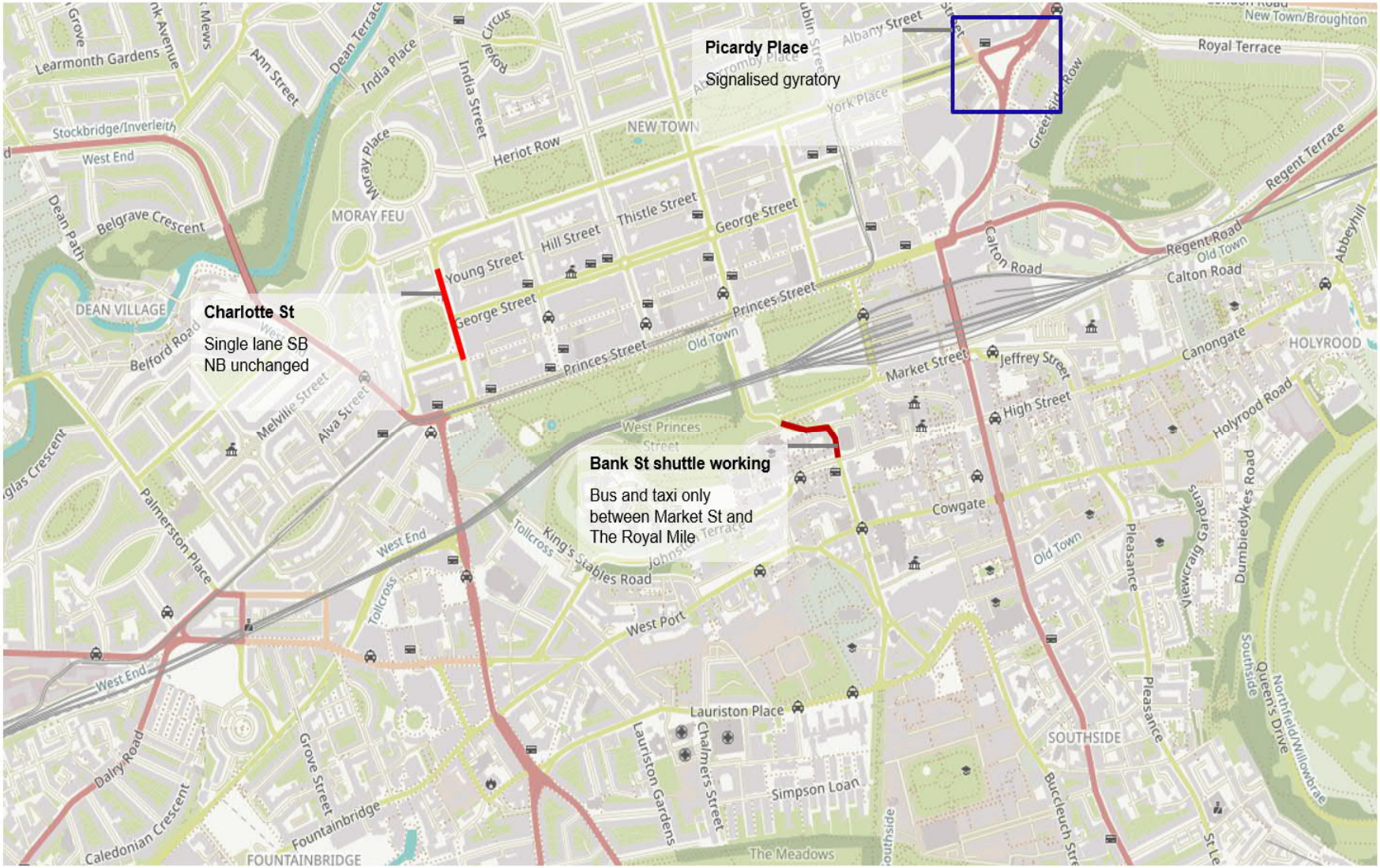
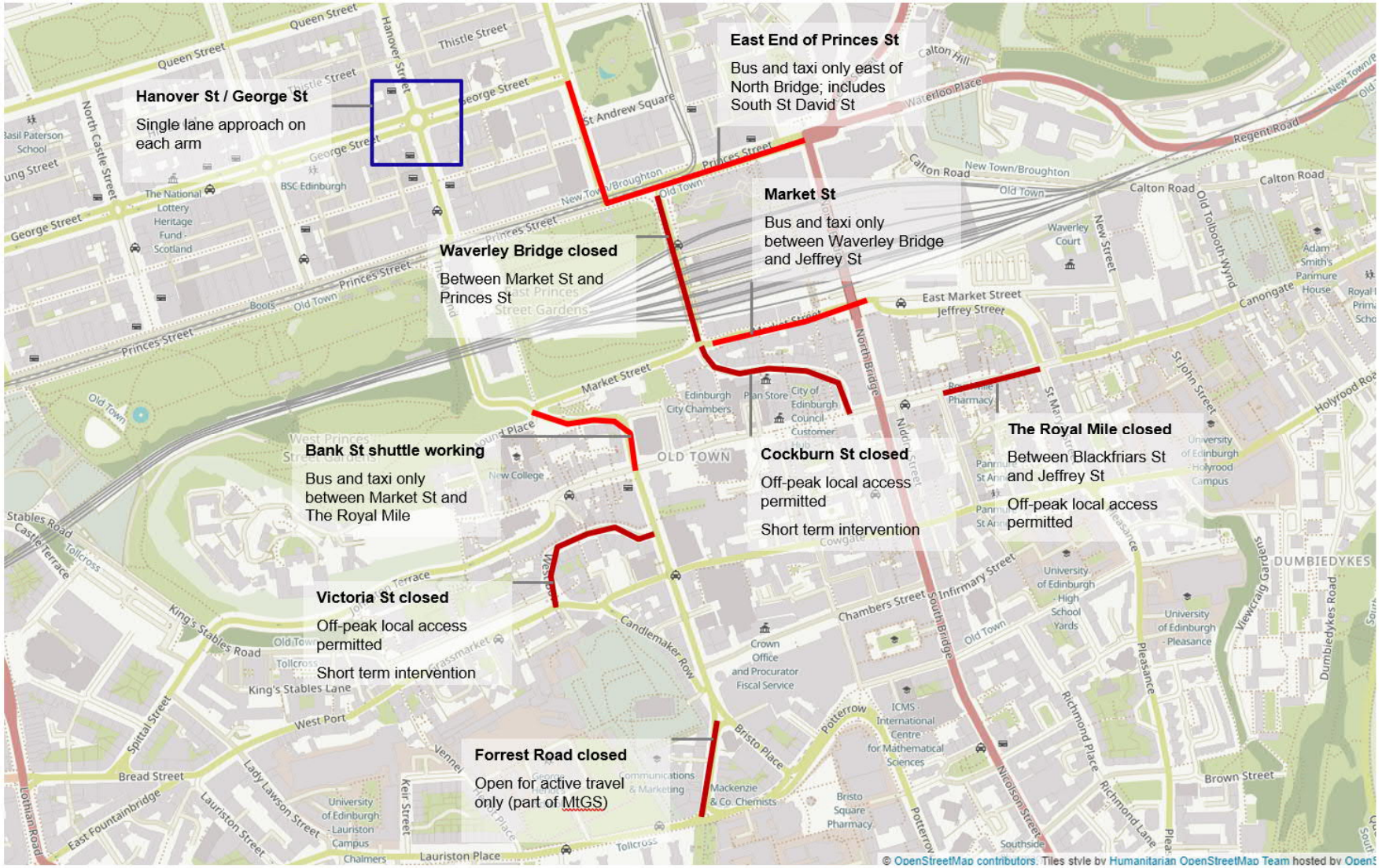


Figure 3.5: ECCT Detailed City Centre Measures



4. Results

4.1 Overview

A VISUM model assignment has been undertaken for each scenario and time period, with traffic flows and speeds subsequently extracted and analysed.

Each LEZ scenario has been compared to the corresponding Base models for a number of key links around the scheme boundary. These links have been selected on the basis that they comprise the major routes throughout the city in proximity to the proposed LEZ boundary.

This chapter summarises the key points from the analysis, by time period.

This analysis only considers the effect of the LEZ on traffic flows. A separate Air Quality modelling exercise will be undertaken by SEPA to consider the impact in emissions and concentrations at the locations referred to in this section.

4.2 West End LEZ Diversion Route

Non-compliant traffic wishing to travel through the west side of the city centre is required to use a diversion route including Semple Street (NB only), Morrison Street, Palmerston Place, Chester Street and St Colme Street.

The changes in total two-way traffic flow and compliance level between the base and scenario models have been assessed in detail along the West End diversion route.

4.2.1 AM Peak

Figure 4.1 and Figure 4.2 present the change in western diversion traffic flows for the original LEZ boundary with ECCT for 2019 and 2023 respectively, relative to their Base models.

Figure 4.1: West End Total Traffic Flow Change Relative to 2019 Base – AM 2019 Original LEZ + ECCT

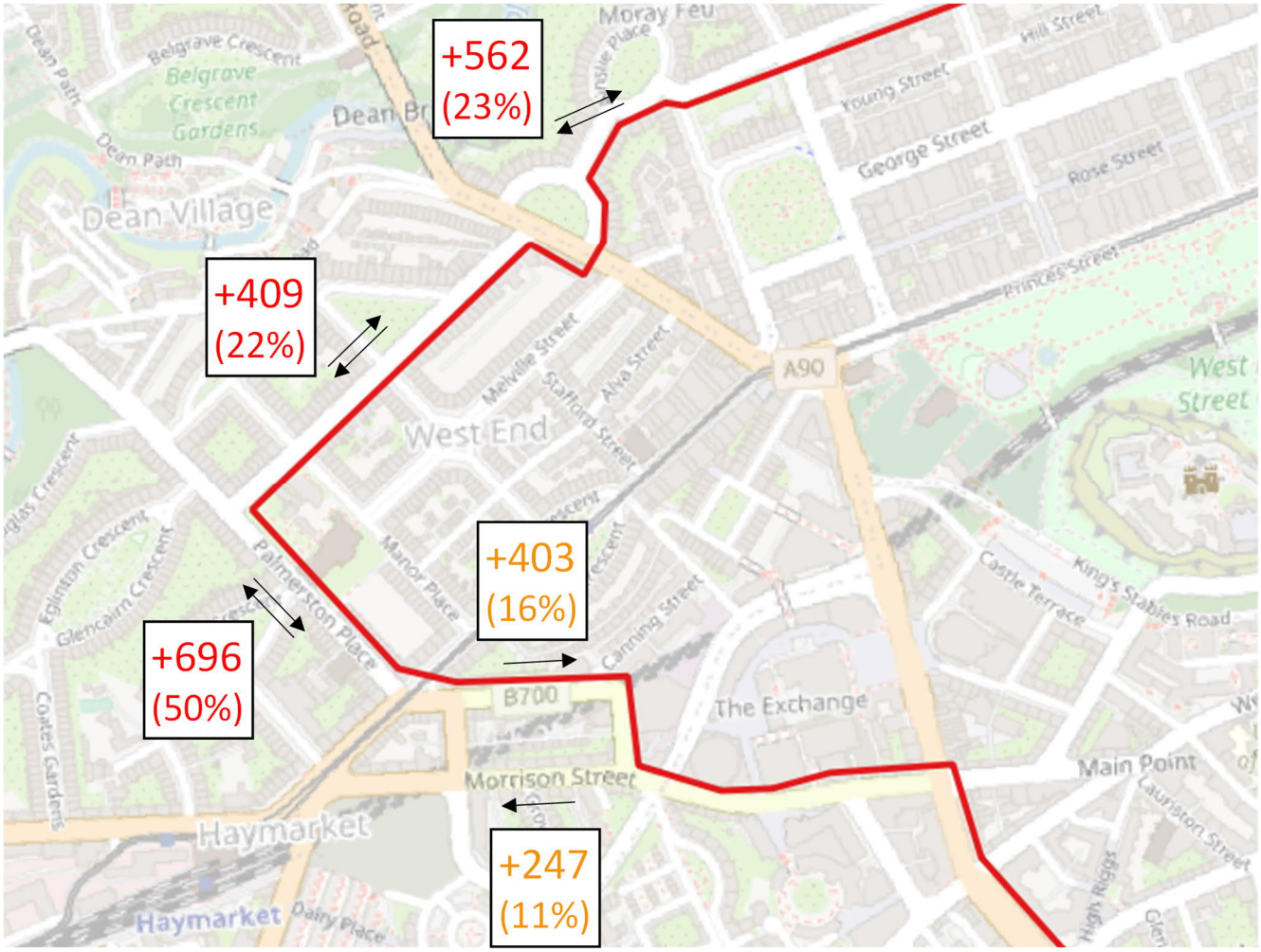


Figure 4.1 indicates that, in the 2019 AM peak, the model predicts a significant increase in traffic along the western diversionary route with the LEZ in place, relative to the Base model. This is due to non-compliant traffic that wishes to travel through the city centre choosing to travel, as anticipated, along the nearest routes to the edge of the LEZ boundary.

Figure 4.2: West End Total Traffic Flow Change Relative to 2023 Base – AM 2023 Original LEZ + ECCT

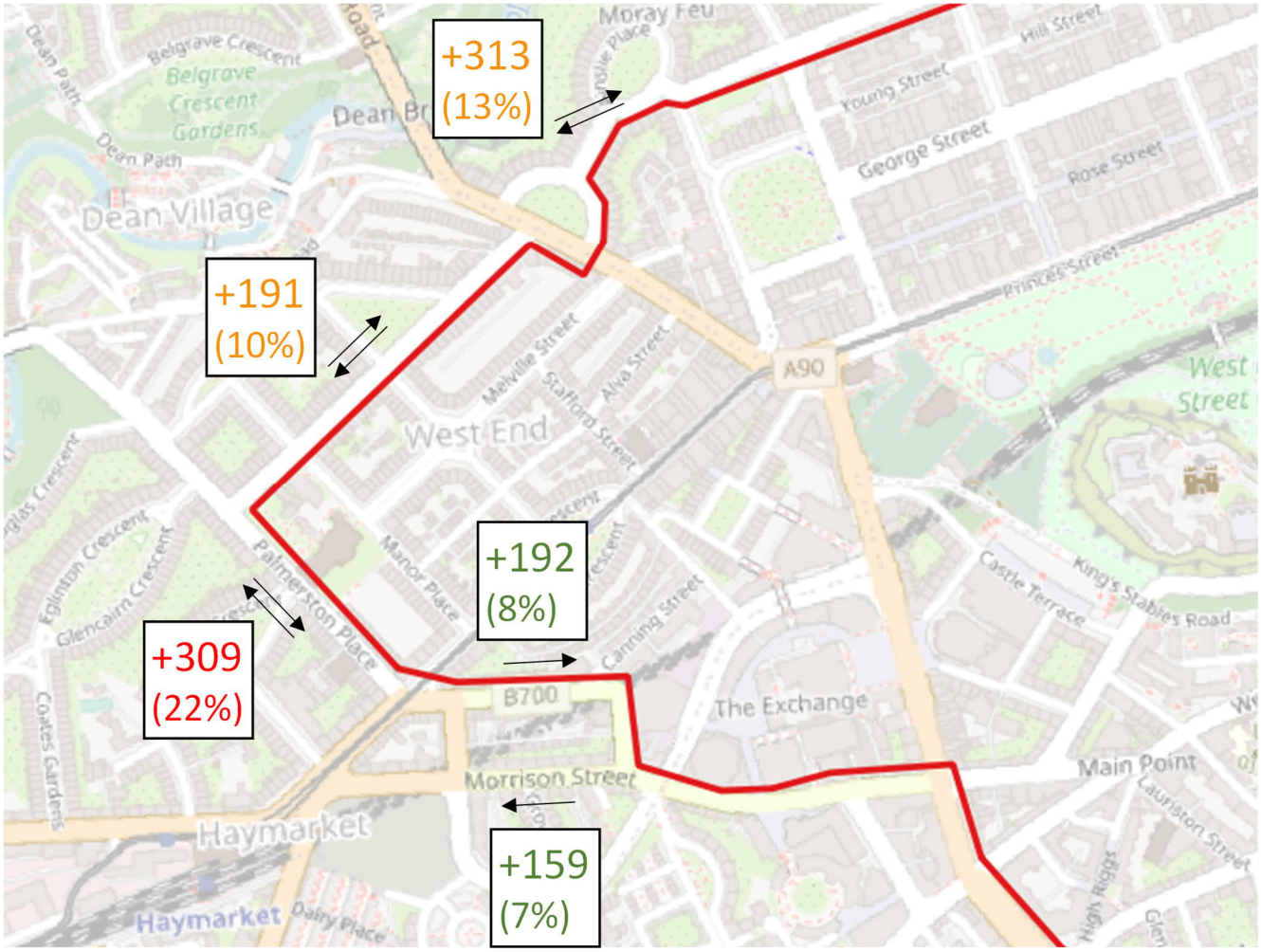


Figure 4.2 demonstrates that the increase in traffic flow observed in the 2019 data is slightly reduced in 2023, so that a smaller increase is observed on the diversionary links relative to the Base model.

4.2.2 Inter Peak

Figure 4.3 and Figure 4.4 present the change in western diversion traffic flows for the original LEZ boundary with ECCT for 2019 and 2023 respectively, relative to their Base models.

Figure 4.3: West End Total Traffic Flow Change Relative to 2019 Base – IP 2019 Original LEZ + ECCT

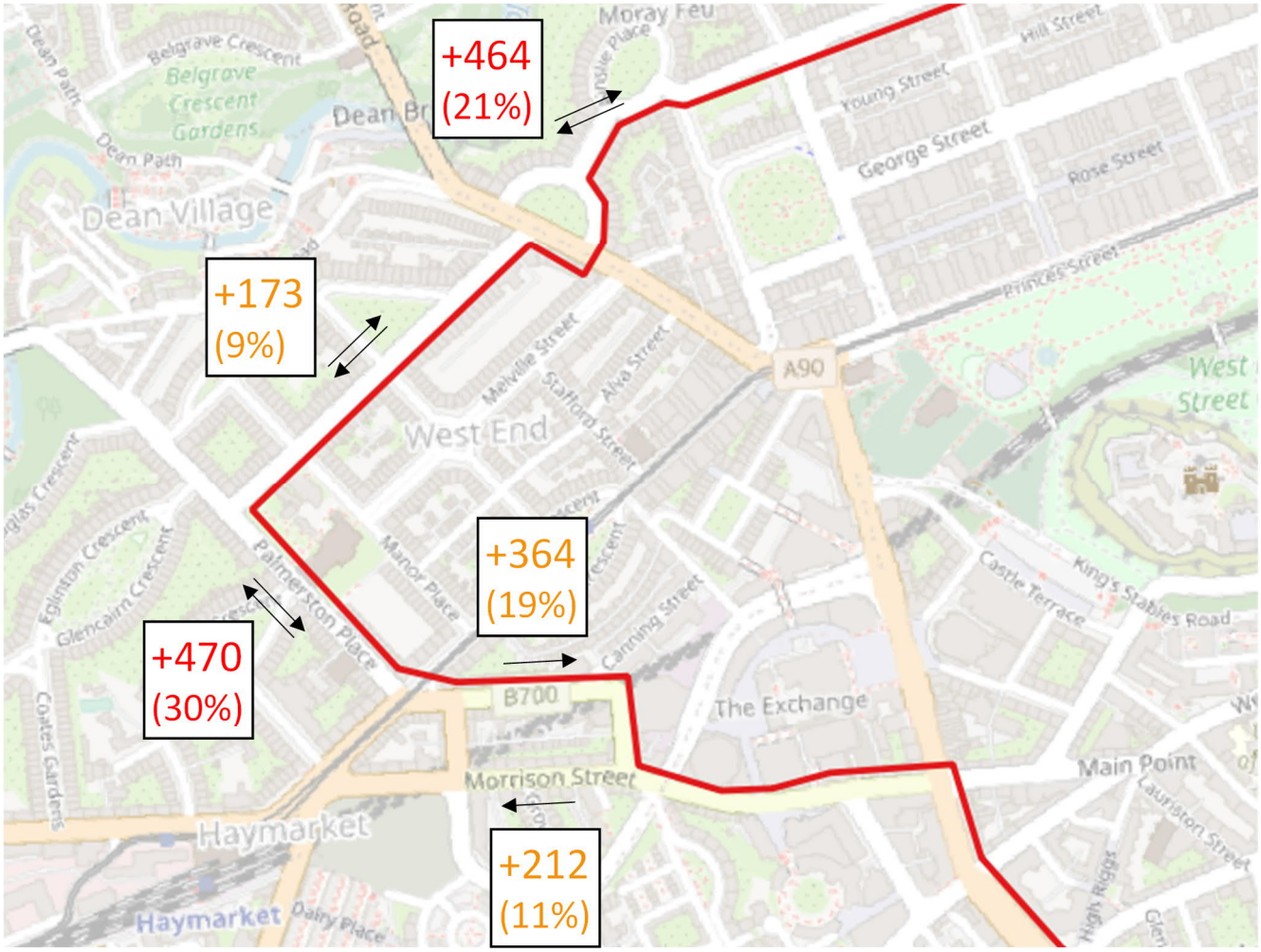


Figure 4.3 above, indicates that, in the 2019 inter-peak, the model predicts a significant increase in traffic along the western diversionary route with the LEZ in place, relative to the Base model. This is due to non-compliant traffic that wishes to travel through the city centre choosing to travel, as anticipated, along the nearest routes to the edge of the LEZ boundary.

Figure 4.4: West End Total Traffic Flow Change Relative to 2023 Base – IP 2023 Original LEZ + ECCT

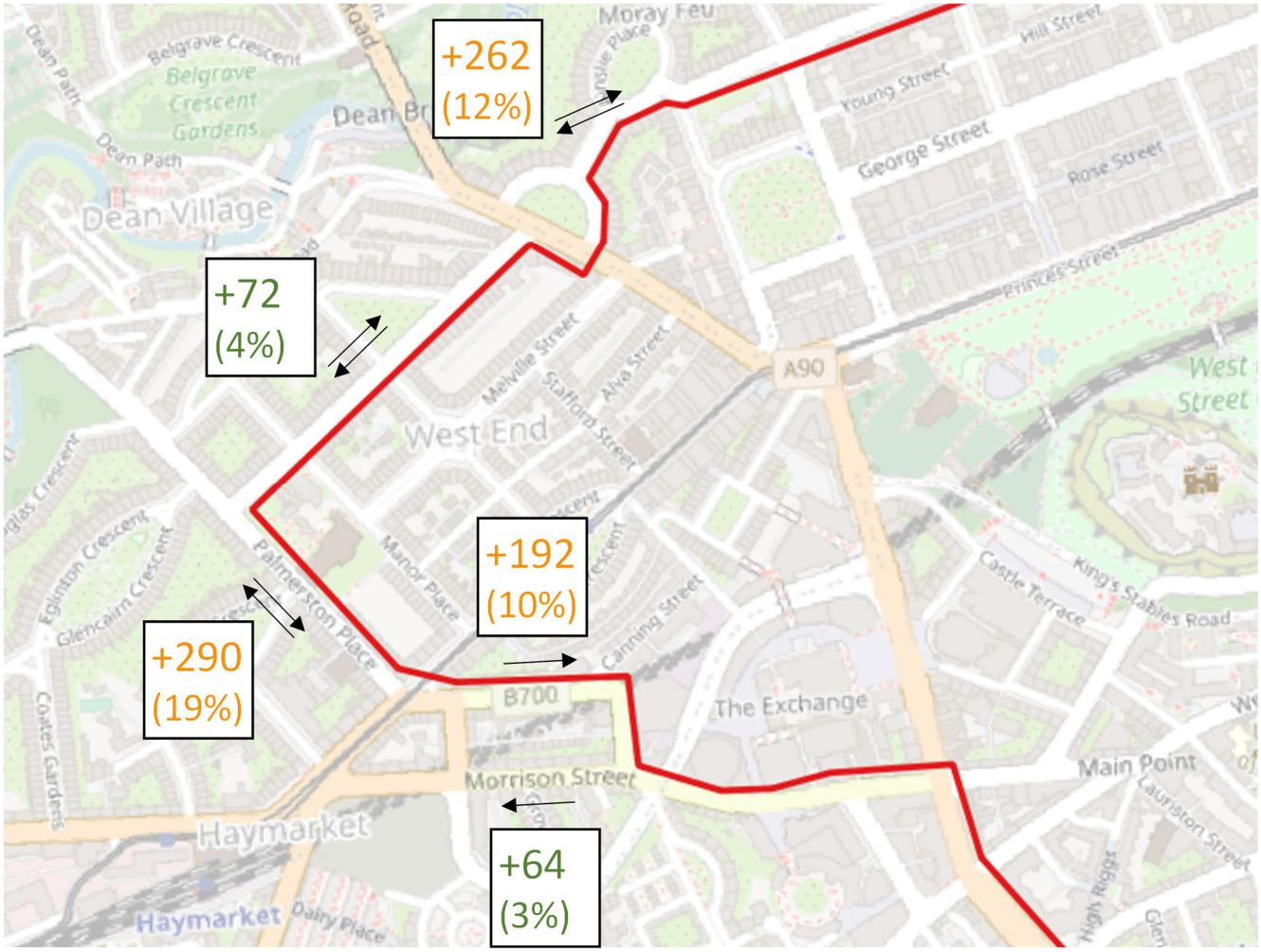


Figure 4.4 demonstrates that the increase in traffic flow observed in the 2019 data is slightly reduced in 2023, so that a smaller increase is observed on the diversionary links relative to the Base model.

4.2.3 PM Peak

Figure 4.5 and Figure 4.6 present the change in western diversion traffic flows for the original LEZ boundary with ECCT for 2019 and 2023 respectively, relative to their Base models.

Figure 4.5: West End Total Traffic Flow Change Relative to 2019 Base – PM 2019 Original LEZ + ECCT

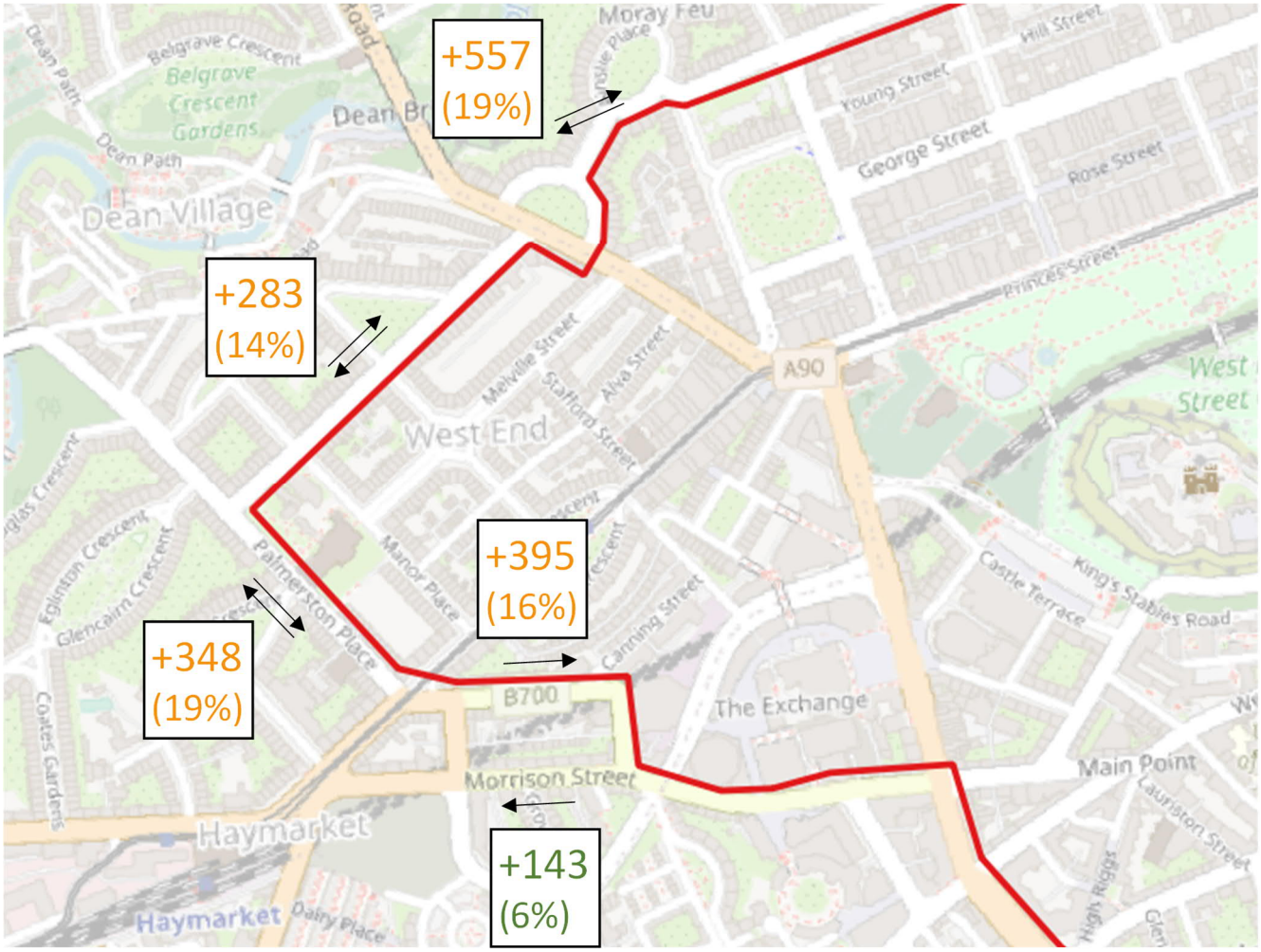


Figure 4.5 above, indicates that, in the 2019 PM peak, the model predicts a significant increase in traffic along the western diversionary route with the LEZ in place, relative to the Base model. This is due to non-compliant traffic that wishes to travel through the city centre choosing to travel, as anticipated, along the nearest routes to the edge of the LEZ boundary.

Figure 4.6: West End Total Traffic Flow Change Relative to 2023 Base – PM 2023 Original LEZ + ECCT

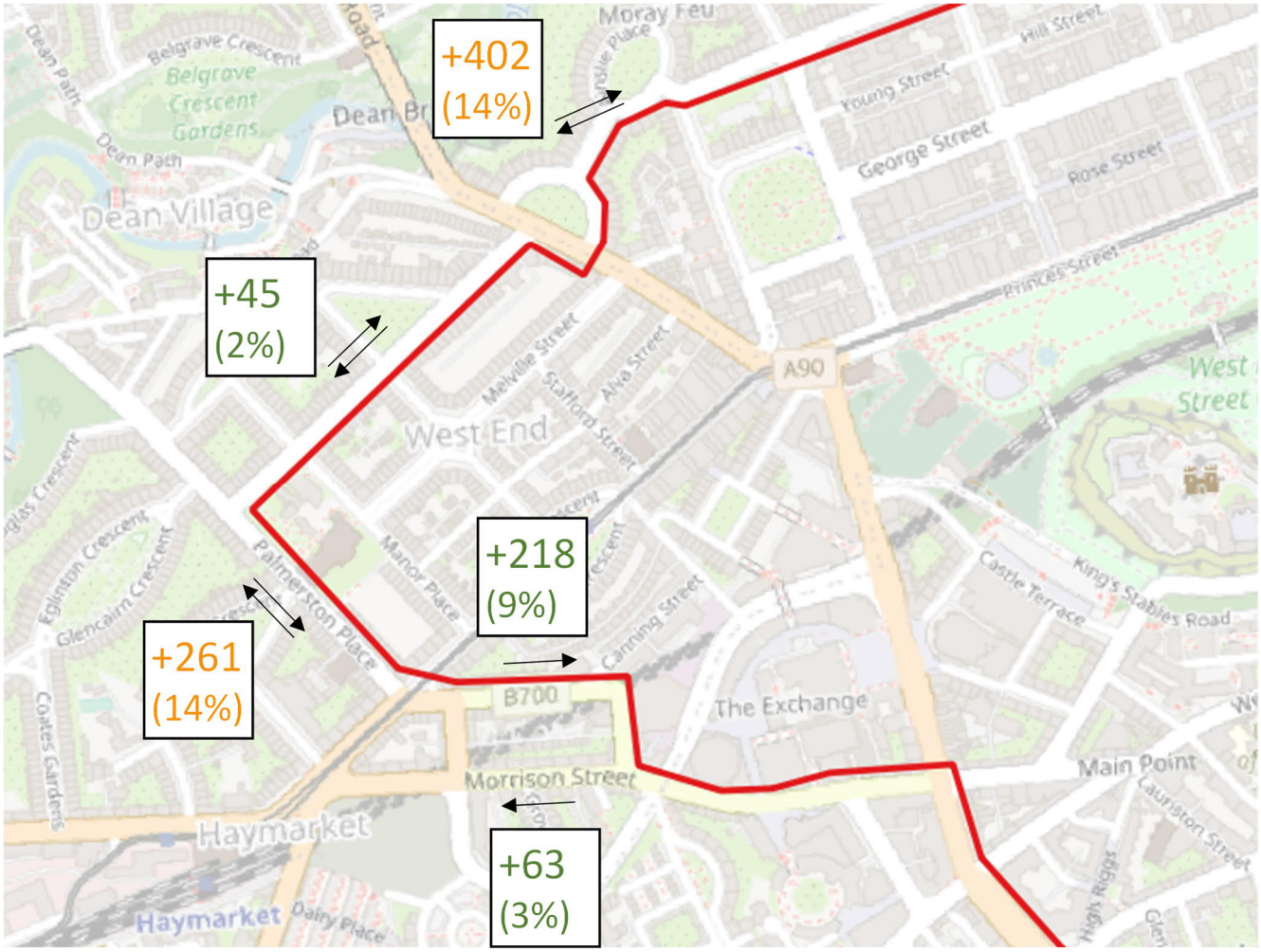


Figure 4.6 demonstrates that the increase in traffic flow observed in the 2019 data is slightly reduced in 2023, so that a smaller increase is observed on the diversionary links relative to the Base model.

4.3 East End LEZ Diversion Route

Non-compliant traffic wishing to travel through the city centre is required to use a diversion route including London Road, Abbeyhill, Horse Wynd (Holyrood Palace) and Queen's Drive.

The changes in total two-way traffic flow and compliance level between the base and scenario models have been assessed in detail along the East End diversion route.

4.3.1 AM Peak

Figure 4.7 and Figure 4.8 present the change in eastern diversion traffic flows for the original LEZ boundary with ECCT for 2019 and 2023 respectively, relative to their Base models.

Figure 4.7: East End Total Traffic Flow Change Relative to 2019 Base – AM 2019 Original LEZ + ECCT

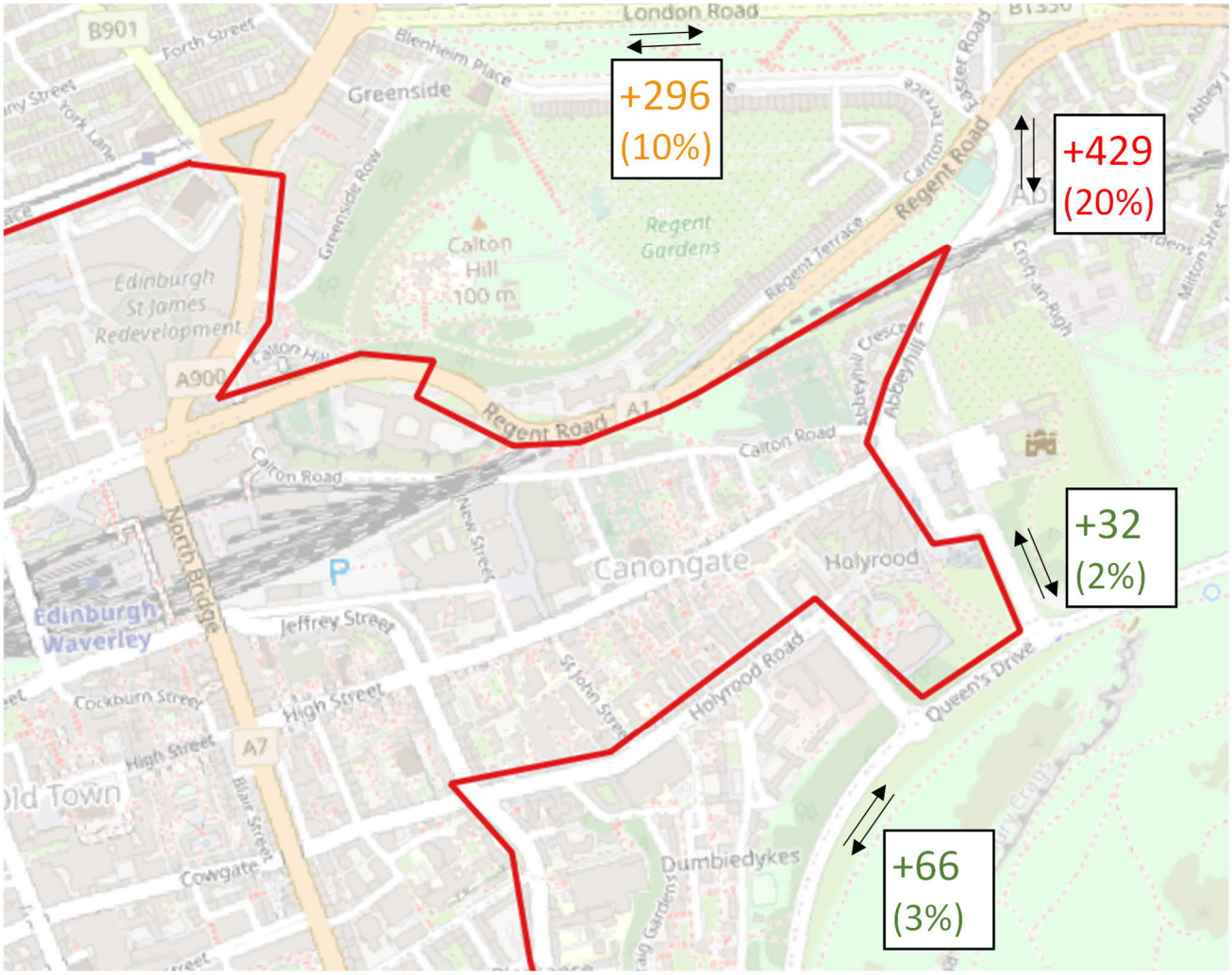


Figure 4.8: East End Total Traffic Flow Change Relative to 2023 Base – AM 2023 Original LEZ + ECCT

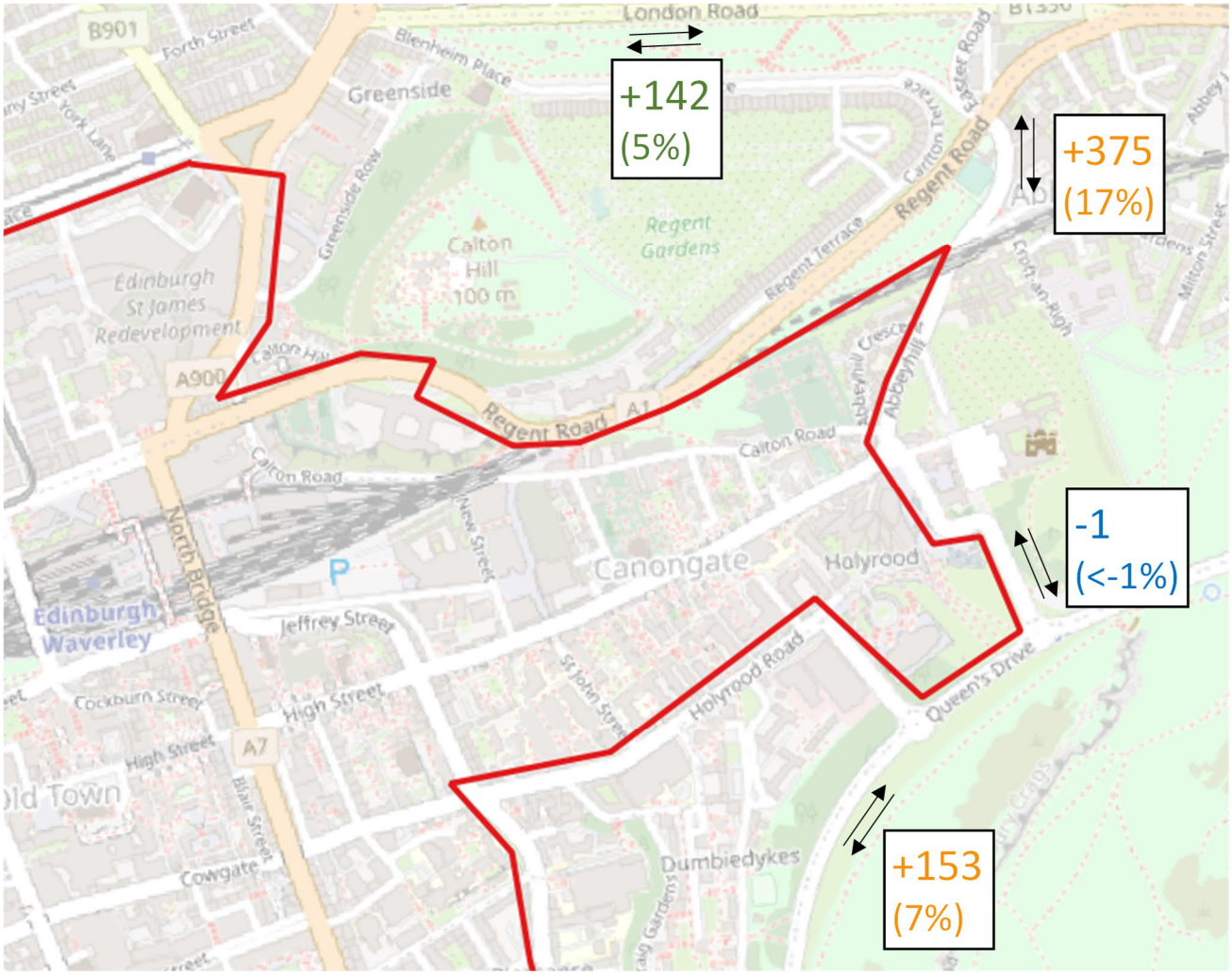


Figure 4.7, above, indicates that, in the 2019 AM peak, the model predicts a significant increase in traffic along the eastern diversionary route with the LEZ in place, relative to the Base model. This is due to non-compliant traffic that wishes to travel through the city centre choosing to travel, as anticipated, along the nearest routes to the edge of the LEZ boundary.

Figure 4.8 demonstrates that the increase in traffic flow observed in the 2019 data is slightly reduced in 2023, so that a smaller increase is observed on the diversionary links relative to the Base model.

4.3.2 Inter Peak

Figure 4.9 and Figure 4.10 present the change in eastern diversion traffic flows for the original LEZ boundary with ECCT for 2019 and 2023 respectively, relative to their Base models.

Figure 4.9: East End Total Traffic Flow Change Relative to 2019 Base – IP 2019 Original LEZ + ECCT

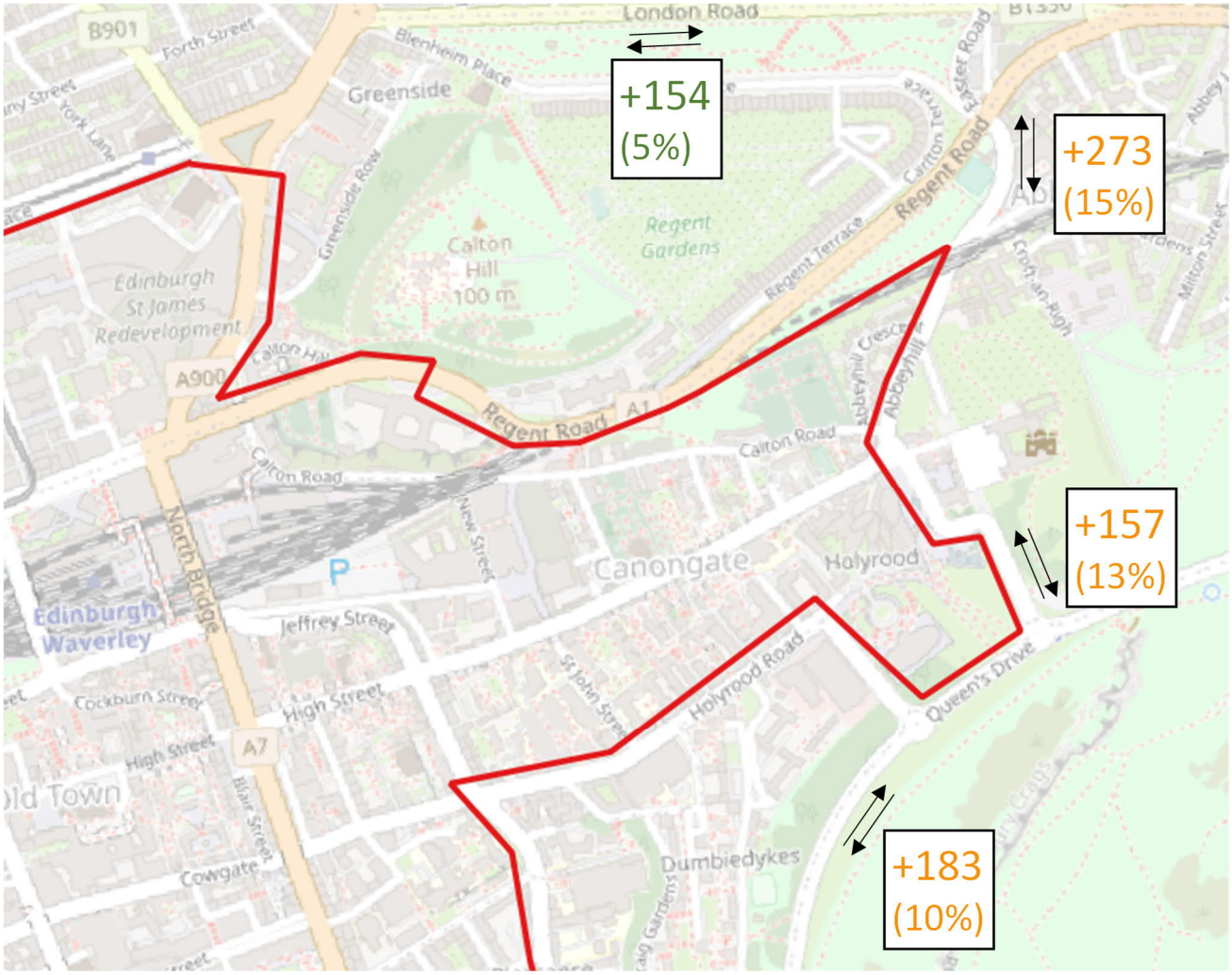


Figure 4.9 indicates that the model predicts an increase in traffic along the eastern diversionary route with the LEZ in place, relative to the Base model. As noted for the AM peak, this is due to non-compliant traffic that wishes to travel through the city centre choosing to travel along the nearest routes to the edge of the LEZ boundary.

Figure 4.10: East End Total Traffic Flow Change Relative to 2023 Base – IP 2023 Original LEZ + ECCT

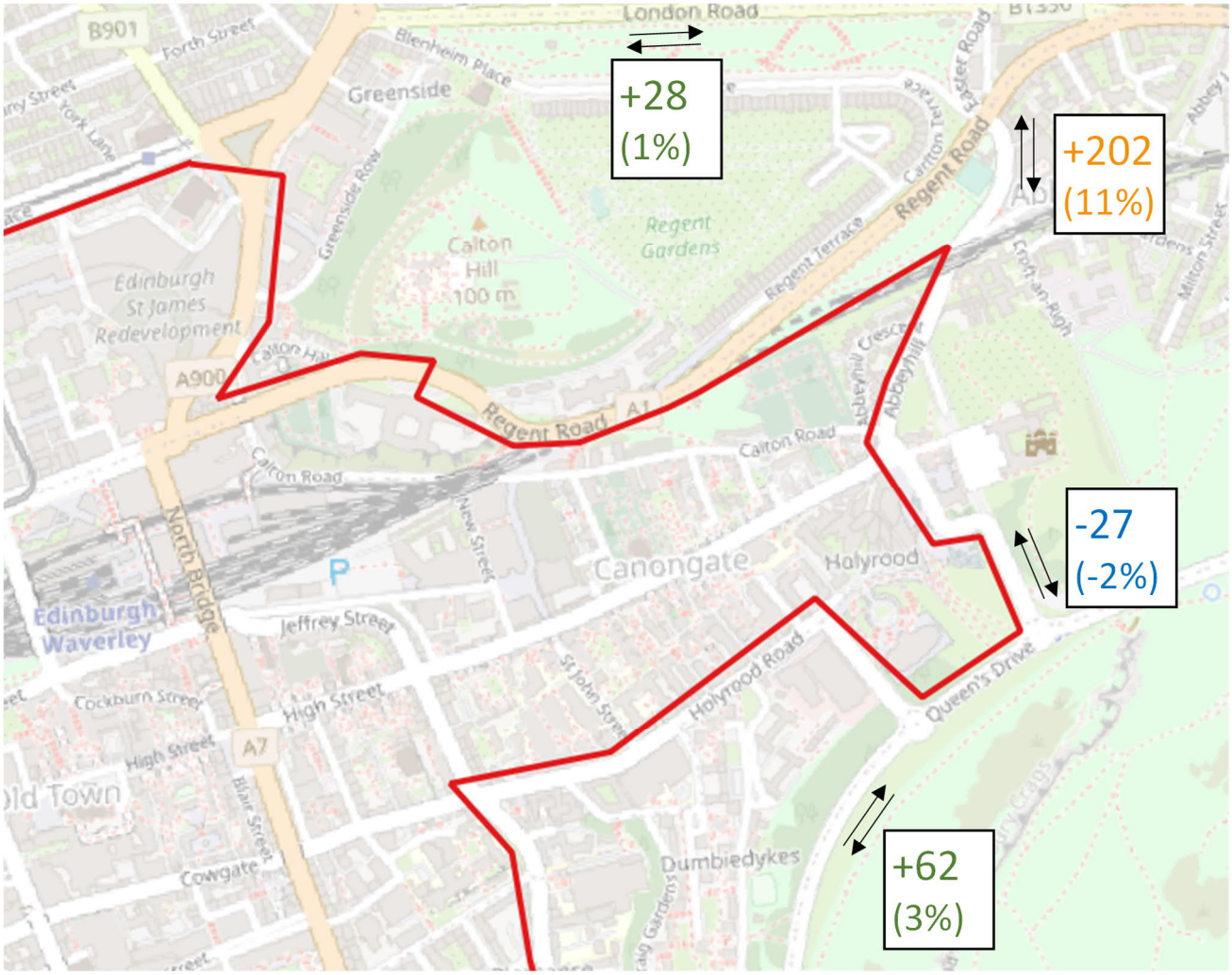


Figure 4.10 demonstrates that the increase in traffic flow observed in the 2019 data is slightly reduced in 2023, so that a smaller increase is observed on the diversionary links relative to the Base model.

4.3.3 PM Peak

Figure 4.11 and Figure 4.12 present the change in eastern diversion traffic flows for the original LEZ boundary with ECCT for 2019 and 2023 respectively, relative to their Base models.

Figure 4.11: East End Total Traffic Flow Change Relative to 2019 Base – PM 2019 Original LEZ + ECCT

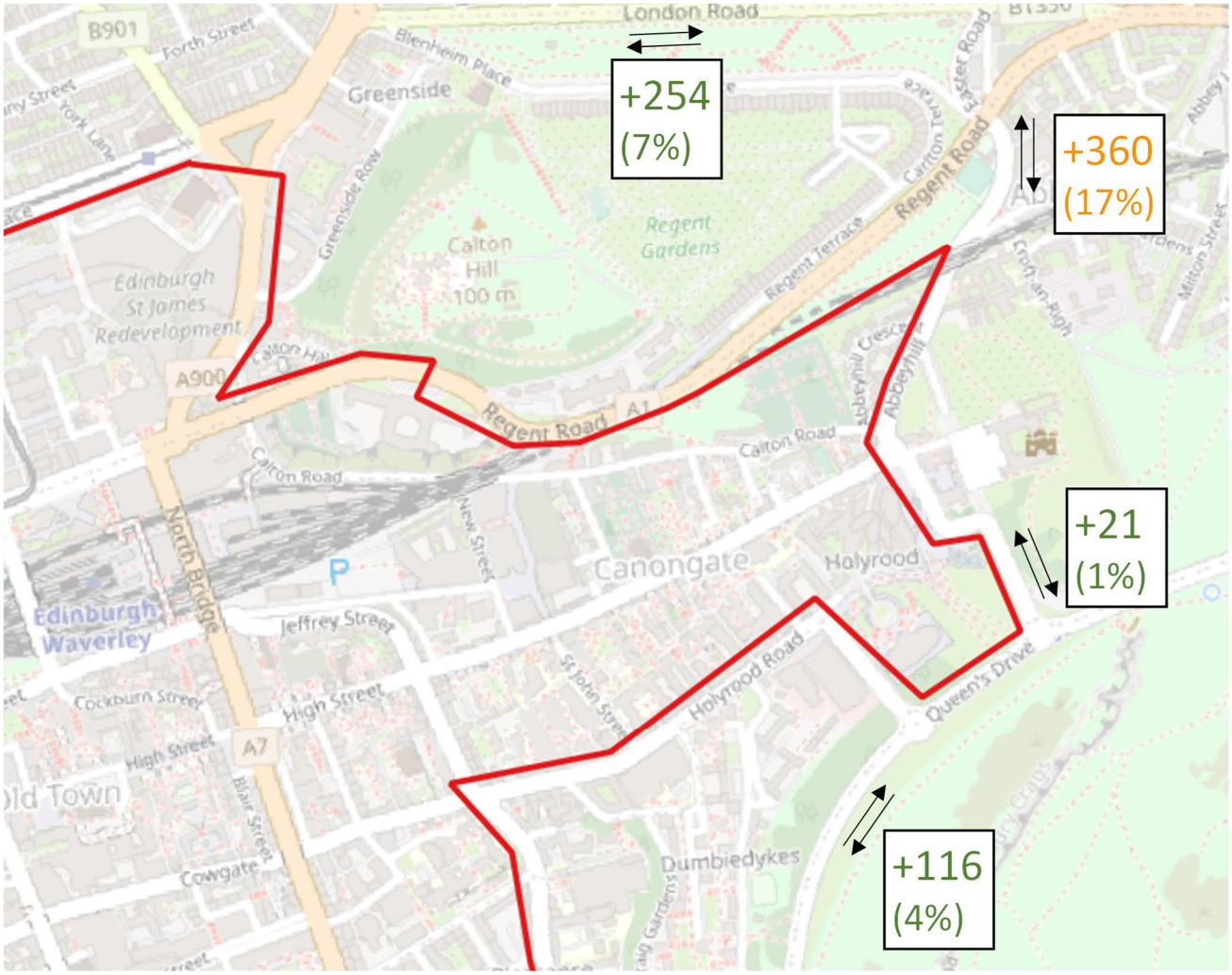


Figure 4.11, above, demonstrates broadly the same pattern of traffic volume changes as noted for the other time periods, i.e. that non-compliant traffic that wishes to travel through the city centre chooses to travel, as anticipated, along the nearest routes to the edge of the LEZ boundary.

Figure 4.12: East End Total Traffic Flow Change Relative to 2023 Base – PM 2023 Original LEZ + ECCT

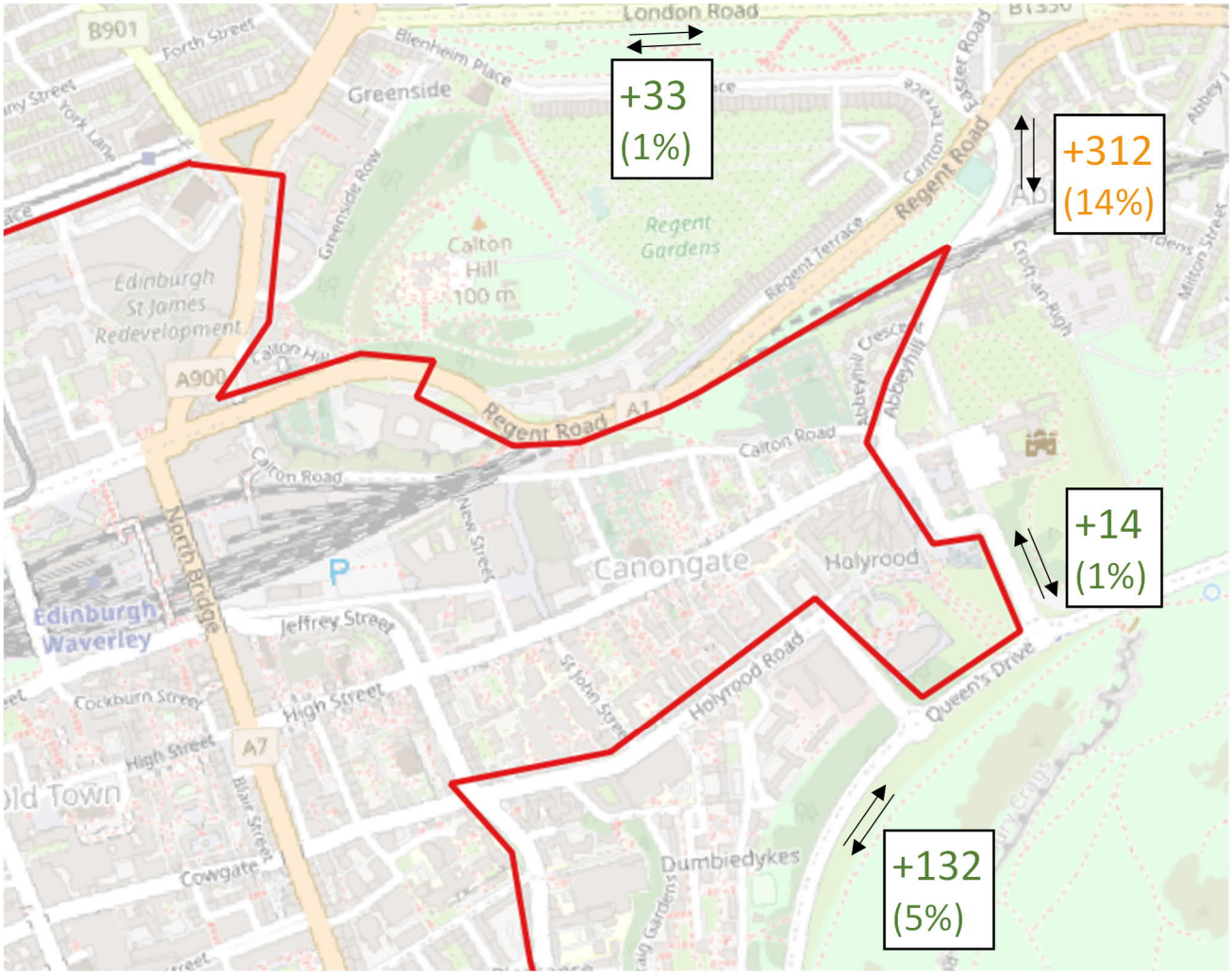


Figure 4.12 demonstrates that the increase in traffic flow observed in the 2019 data is slightly reduced in 2023, so that a smaller increase is observed on the diversionary links relative to the Base model.

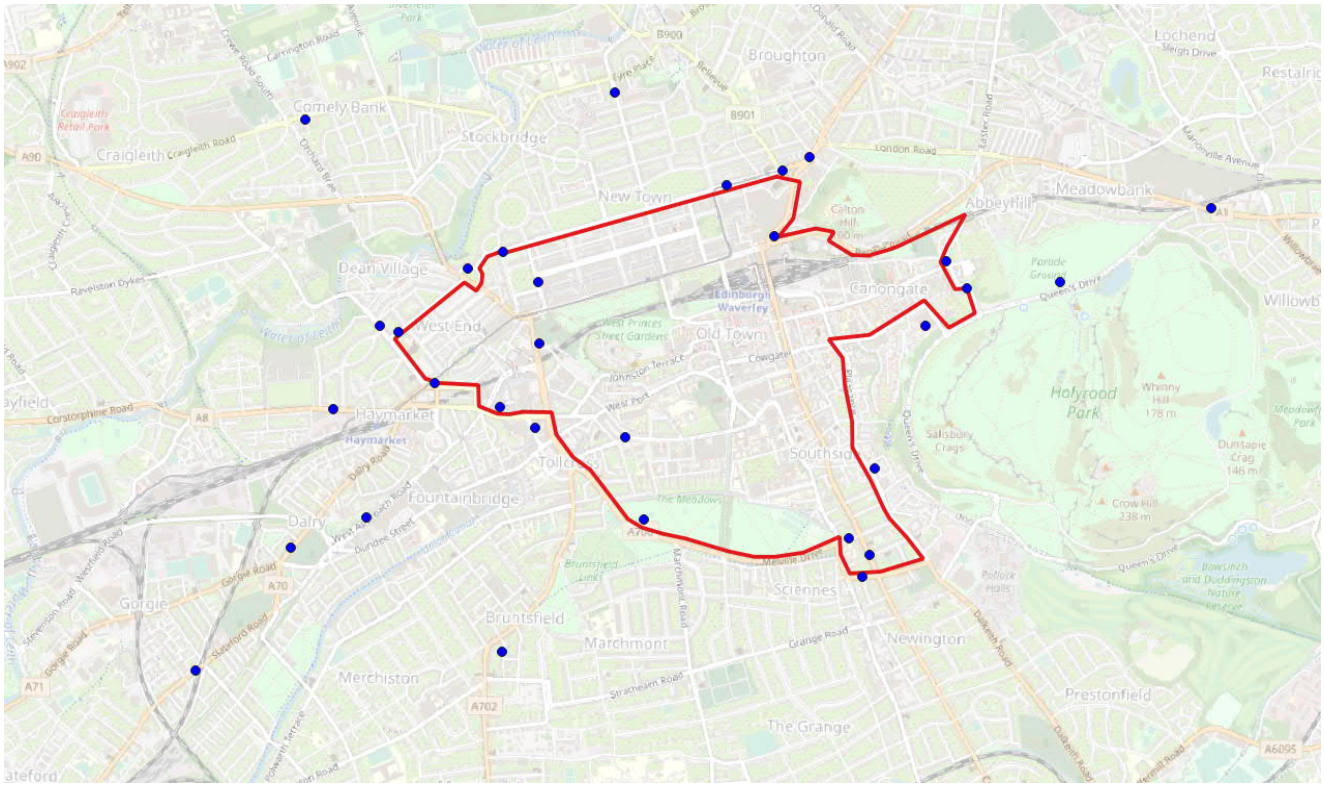
4.4 Key Links

In addition to reviewing the diversion routes, the traffic flows and compliance levels have been assessed for 20 key roads around central Edinburgh, in order to give a broader overview of how the traffic flows and compliance rates change in Edinburgh as a result of the LEZ.

The majority of the 20 key links referenced in this section were also used in the previous 2019 LEZ modelling task undertaken by Jacobs, and so, for consistency, these routes have also been used for this modelling exercise.

The LEZ boundary and key assessment links are illustrated in Figure 4.13.

Figure 4.13: LEZ Boundary and Key Assessment Links



4.4.1 AM Peak

Two-way AM compliant and non-compliant flows by link are summarised for the original LEZ boundary with ECCT option for 2019 and 2023 respectively in Table 4.1 and Table 4.2 below.

Table 4.1: Two-way Traffic Flow – AM 2019, Original LEZ + ECCT

2019 AM		Two-way traffic flow in vehicles (07:00-09:00)							
ID	Description	Total Compliant	Total Non-Compliant	All Vehicles	Compliant vs Base	Non-Compliant vs Base	Total vs Base	Compliant %	Non-Compliant %
1	Dalry Road	1,210	923	2,133	-88	+210	+122	57%	43%
2	Palmerston Place	2,654	1,204	3,858	+160	-183	-23	69%	31%
3	Great Stuart Street	1,648	23	1,671	+444	-636	-192	99%	1%
4	York Place	2,025	583	2,608	+656	-212	+444	78%	22%
5	Dundas Street	1,282	248	1,530	-19	-504	-523	84%	16%
6	Leith Walk	2,674	835	3,509	+483	-410	+73	76%	24%
7	London Road	1,564	674	2,238	+171	-49	+122	70%	30%
8	Queen's Drive	1,493	386	1,879	+452	-217	+235	79%	21%
9	South Clerk Street	1,413	0	1,413	+417	-545	-128	100%	0%
10	Melville Drive	1,761	849	2,610	+87	-64	+23	67%	33%
11	Lothian Road	3,220	340	3,560	+1185	-764	+421	90%	10%
12	Bruntsfield Place	1,825	498	2,323	+219	-343	-124	79%	21%
13	West Approach Road	3,131	387	3,518	+713	-942	-229	89%	11%
14	Charlotte Square	3,033	3	3,036	+1156	-1045	+111	99%	1%
15	Morrison Street	2,631	833	3,464	+742	-252	+490	76%	24%
16	Randolph Crescent	993	488	1,481	+182	+1	+183	67%	33%
17	Leith Street	2,214	7	2,221	+834	-744	+90	99%	1%
18	Pleasance	1,881	154	2,035	+667	-524	+143	92%	8%
19	Hope Park Terrace	1,051	0	1,051	+301	-427	-126	100%	0%
20	West Preston Street	466	829	1,295	-324	+418	+94	36%	64%

The above demonstrates that the non-compliant traffic flows are lower with the LEZ boundary in place on a significant number of key roads within and surrounding Edinburgh city centre.

Compliance within the city centre is very high, with South Clerk Street and Hope Park Terrace demonstrating 100% compliance. The model uses a ‘cost’ factor at the entry points to the LEZ for non-compliant vehicles (to replicate the effect of a financial charge). This high perceived ‘cost’ to non-compliant vehicles deters the vast majority (or all) of them from entering the LEZ, therefore the majority of links within the LEZ experience 100% compliance (or close to it).

The lowest compliance observed in Table 4.1 is on West Preston Street with 36% compliance, followed by Dalry Road with 57% compliance. These compliance levels are to be expected (in 2019) on these roads, as they are located just outside the LEZ boundary and, therefore, they are anticipated to experience an increase in non-compliant traffic when the LEZ is implemented.

Table 4.2: Two-way Traffic Flow – AM 2023, Original LEZ + ECCT

2023 AM		Two-way traffic flow in vehicles (07:00-09:00)							
ID	Description	Total Compliant	Total Non-Compliant	All Vehicles	Compliant vs Base	Non-Compliant vs Base	Total vs Base	Compliant %	Non-Compliant %
1	Dalry Road	1,784	292	2,076	+2	+74	+76	86%	14%
2	Palmerston Place	3,503	371	3,874	+41	-57	-16	90%	10%
3	Great Stuart Street	1,693	5	1,698	+41	-197	-156	100%	0%
4	York Place	2,402	182	2,584	+474	-60	+414	93%	7%
5	Dundas Street	1,500	79	1,579	-332	-153	-485	95%	5%
6	Leith Walk	3,152	247	3,399	+104	-131	-27	93%	7%
7	London Road	1,986	203	2,189	+95	-17	+78	91%	9%
8	Queen's Drive	1,539	119	1,658	+71	-61	+10	93%	7%
9	South Clerk Street	1,469	0	1,469	+94	-168	-74	100%	0%
10	Melville Drive	2,374	280	2,654	+67	0	+67	89%	11%
11	Lothian Road	3,456	111	3,567	+652	-227	+425	97%	3%
12	Bruntsfield Place	2,211	156	2,367	+16	-102	-86	93%	7%
13	West Approach Road	3,516	119	3,635	+223	-285	-62	97%	3%
14	Charlotte Square	3,297	1	3,298	+677	-320	+357	99%	1%
15	Morrison Street	3,182	247	3,429	+542	-83	+459	93%	7%
16	Randolph Crescent	1,196	153	1,349	+47	+3	+50	89%	11%
17	Leith Street	2,407	2	2,409	+509	-227	+282	99%	1%
18	Pleasance	1,809	45	1,854	+150	-161	-11	98%	2%
19	Hope Park Terrace	1,086	0	1,086	+33	-130	-97	100%	0%
20	West Preston Street	923	249	1,172	-178	+119	-59	79%	21%

By 2023, the overall vehicle fleet will be significantly cleaner, and this is reflected in Table 4.2 above. Compliance within the city centre is extremely high, with several links indicating over 99% compliance.

As seen in the 2019 data, the lowest compliance expected in 2023 is on West Preston Street, however, at 79%, this is a much higher compliance level than in 2019. The compliance on Dalry Road has increased to 86%, up 29 percentage points from 2019.

4.4.2 Inter Peak

Two-way IP compliant and non-compliant flows by link are summarised for the original LEZ boundary with ECCT scenario for 2019 and 2023 respectively in Table 4.3 and 4.4 below.

Table 4.3: Two-way Traffic Flow – IP 2019, Original LEZ + ECCT

2019 IP		Two-way traffic flow in vehicles (10:00-12:00)							
ID	Description	Total Compliant	Total Non-Compliant	All Vehicles	Compliant vs Base	Non-Compliant vs Base	Total vs Base	Compliant %	Non-Compliant %
1	Dalry Road	876	574	1,450	-6	+50	+44	60%	40%
2	Palmerston Place	2,020	917	2,937	+136	-164	-28	69%	31%
3	Great Stuart Street	1,339	11	1,350	+346	-557	-211	99%	1%
4	York Place	2,486	512	2,998	+899	-462	+437	83%	17%
5	Dundas Street	1,367	204	1,571	+227	-477	-250	87%	13%
6	Leith Walk	2,962	990	3,952	+505	-504	+1	75%	25%
7	London Road	1,190	591	1,781	+119	-41	+78	67%	33%
8	Queen's Drive	1,624	319	1,943	+398	-367	+31	84%	16%
9	South Clerk Street	1,301	1	1,302	+494	-476	+18	100%	0%
10	Melville Drive	1,973	744	2,717	+347	-190	+157	73%	27%
11	Lothian Road	3,339	337	3,676	+1445	-808	+637	91%	9%
12	Bruntsfield Place	1,461	392	1,853	+263	-320	-57	79%	21%
13	West Approach Road	2,396	225	2,621	+727	-768	-41	91%	9%
14	Charlotte Square	3,036	2	3,038	+1357	-1022	+335	100%	0%
15	Morrison Street	3,663	989	4,652	+1032	-617	+415	79%	21%
16	Randolph Crescent	733	427	1,160	+28	+8	+36	63%	37%
17	Leith Street	2,672	9	2,681	+1019	-951	+68	100%	0%
18	Pleasance	1,087	81	1,168	+304	-396	-92	93%	7%
19	Hope Park Terrace	1,354	0	1,354	+471	-519	-48	100%	0%
20	West Preston Street	437	666	1,103	-247	+304	+57	40%	60%

The above demonstrates that the non-compliant traffic flows are lower with the LEZ boundary in place on a significant number of key roads within and surrounding Edinburgh city centre.

Compliance within the city centre is very high, with several links demonstrating 100% compliance, as noted (and explained) in the AM peak analysis.

Similar to the AM peak, West Preston Street and Dalry Road indicate the lowest compliance levels of the key assessment links, with 40% and 60% respectively for 2019 in the inter-peak.

Table 4.4: Two-way Traffic Flow – IP 2023, Original LEZ + ECCT

2023 IP		Two-way traffic flow in vehicles (10:00-12:00)							
ID	Description	Total Compliant	Total Non-Compliant	All Vehicles	Compliant vs Base	Non-Compliant vs Base	Total vs Base	Compliant %	Non-Compliant %
1	Dalry Road	1,228	179	1,407	-27	+19	-8	87%	13%
2	Palmerston Place	2,658	280	2,938	+17	-48	-31	90%	10%
3	Great Stuart Street	1,436	3	1,439	+43	-168	-125	100%	0%
4	York Place	2,811	159	2,970	+533	-134	+399	95%	5%
5	Dundas Street	1,492	58	1,550	-118	-152	-270	96%	4%
6	Leith Walk	3,576	299	3,875	+71	-152	-81	92%	8%
7	London Road	1,533	171	1,704	+18	-18	0	90%	10%
8	Queen's Drive	1,801	96	1,897	+83	-111	-28	95%	5%
9	South Clerk Street	1,291	0	1,291	+145	-144	+1	100%	0%
10	Melville Drive	2,467	237	2,704	+192	-49	+143	91%	9%
11	Lothian Road	3,475	100	3,575	+788	-248	+540	97%	3%
12	Bruntsfield Place	1,753	121	1,874	+64	-93	-29	94%	6%
13	West Approach Road	2,558	69	2,627	+216	-234	-18	97%	3%
14	Charlotte Square	3,213	0	3,213	+825	-313	+512	100%	0%
15	Morrison Street	4,344	299	4,643	+580	-187	+393	94%	6%
16	Randolph Crescent	1,028	134	1,162	+31	+6	+37	88%	12%
17	Leith Street	2,810	2	2,812	+489	-285	+204	100%	0%
18	Pleasance	1,187	20	1,207	+73	-123	-50	98%	2%
19	Hope Park Terrace	1,416	0	1,416	+188	-156	+32	100%	0%
20	West Preston Street	787	201	988	-159	+89	-70	80%	20%

By 2023, the overall vehicle fleet will be significantly cleaner, and this is reflected in Table 4.4 above. Compliance within the city centre is extremely high, with several links indicating over 99% compliance. All key assessment links demonstrate a significant increase in compliance.

4.4.3 PM Peak

Two-way PM compliant and non-compliant flows by link are summarised the original LEZ boundary with ECCT for 2019 and 2023 respectively in Table 4.5 and 4.6 below.

Table 4.5: Two-way Traffic Flow – PM 2019, Original LEZ + ECCT

2019 PM		Two-way traffic flow in vehicles (16:00-18:00)							
ID	Description	Total Compliant	Total Non-Compliant	All Vehicles	Compliant vs Base	Non-Compliant vs Base	Total vs Base	Compliant %	Non-Compliant %
1	Dalry Road	965	736	1,701	-65	+212	+147	57%	43%
2	Palmerston Place	2,761	1,305	4,066	+82	-55	+27	68%	32%
3	Great Stuart Street	1,326	40	1,366	+274	-511	-237	97%	3%
4	York Place	2,183	659	2,842	+456	-253	+203	77%	23%
5	Dundas Street	1,610	248	1,858	+176	-496	-320	87%	13%
6	Leith Walk	2,813	927	3,740	+342	-386	-44	75%	25%
7	London Road	1,510	615	2,125	+43	-145	-102	71%	29%
8	Queen's Drive	1,973	463	2,436	+486	-340	+146	81%	19%
9	South Clerk Street	1,499	5	1,504	+513	-520	-7	100%	0%
10	Melville Drive	2,498	991	3,489	+310	-167	+143	72%	28%
11	Lothian Road	3,547	381	3,928	+1290	-818	+472	90%	10%
12	Bruntsfield Place	1,973	440	2,413	+287	-422	-135	82%	18%
13	West Approach Road	3,445	452	3,897	+678	-1005	-327	88%	12%
14	Charlotte Square	2,946	8	2,954	+1097	-973	+124	100%	0%
15	Morrison Street	3,520	927	4,447	+657	-591	+66	79%	21%
16	Randolph Crescent	753	509	1,262	-11	+106	+95	60%	40%
17	Leith Street	2,537	39	2,576	+704	-932	-228	98%	2%
18	Pleasance	1,708	69	1,777	+556	-526	+30	96%	4%
19	Hope Park Terrace	1,565	3	1,568	+470	-562	-92	100%	0%
20	West Preston Street	595	941	1,536	-311	+445	+134	39%	61%

The above demonstrates that the non-compliant traffic flows are lower with the LEZ boundary in place on a significant number of key roads within and surrounding Edinburgh city centre.

As seen in the other time periods, compliance within the city centre is very high, with South Clerk Street and Hope Park Terrace demonstrating 100% compliance.

Similar to the other time periods, West Preston Street and Dalry Road indicate the lowest compliance levels of the key assessment links, with 39% and 57% respectively for 2019 in the PM peak.

Table 4.6: Two-way Traffic Flow – AM 2023, Original LEZ + ECCT

2023 PM		Two-way traffic flow in vehicles (16:00-18:00)							
ID	Description	Total Compliant	Total Non-Compliant	All Vehicles	Compliant vs Base	Non-Compliant vs Base	Total vs Base	Compliant %	Non-Compliant %
1	Dalry Road	1,425	235	1,660	+40	+75	+115	86%	14%
2	Palmerston Place	3,621	399	4,020	-1	-22	-23	90%	10%
3	Great Stuart Street	1,379	11	1,390	-57	-160	-217	99%	1%
4	York Place	2,610	202	2,812	+249	-79	+170	93%	7%
5	Dundas Street	1,809	82	1,891	-165	-151	-316	96%	4%
6	Leith Walk	3,355	276	3,631	-31	-130	-161	92%	8%
7	London Road	1,915	188	2,103	-74	-47	-121	91%	9%
8	Queen's Drive	2,163	139	2,302	+128	-109	+19	94%	6%
9	South Clerk Street	1,464	1	1,465	+145	-158	-13	100%	0%
10	Melville Drive	3,214	315	3,529	+227	-43	+184	91%	9%
11	Lothian Road	3,807	124	3,931	+735	-244	+491	97%	3%
12	Bruntsfield Place	2,338	138	2,476	+57	-130	-73	94%	6%
13	West Approach Road	3,861	133	3,994	+78	-321	-243	97%	3%
14	Charlotte Square	3,144	2	3,146	+632	-299	+333	100%	0%
15	Morrison Street	4,171	277	4,448	+268	-190	+78	94%	6%
16	Randolph Crescent	985	161	1,146	-60	+37	-23	86%	14%
17	Leith Street	2,727	11	2,738	+216	-295	-79	100%	0%
18	Pleasance	1,750	19	1,769	+170	-163	+7	99%	1%
19	Hope Park Terrace	1,612	1	1,613	+140	-172	-32	100%	0%
20	West Preston Street	1,130	288	1,418	-110	+134	+24	80%	20%

By 2023, the overall vehicle fleet will be significantly cleaner, and this is reflected in Table 4.6 above. Compliance within the city centre is extremely high, with several links indicating over 99% compliance. All key assessment links demonstrate a significant increase in compliance.

Whilst the tables in this section indicate the anticipated flow changes in each assessment year, in reality changes in travel patterns take time to settle down, rather than overnight, as drivers take time to determine their optimum route. This means that following the implementation of the LEZ, one would not necessarily expect to immediately see the changes described in the above tables, rather these flow changes are likely to occur over a period of weeks/months following LEZ implementation.

When viewing the above tables, it is important to place the changes in traffic flows in context; in the real world, as schemes are approved and constructed, traffic flows on these links will inevitably change. However, the numbers reported in these tables purely capture the effect of the LEZ.

4.5 Compliance by Diversion Street and Assessment Year

Figures 4.14 to 4.16 summarise total vehicle compliance by link for each scenario. They show how the number of compliant vehicles varies and the overall improvement over time.

By 2023, the number of vehicles which do not meet LEZ requirements is lower than in the Base across all links analysed, even though many of these lie on or close the LEZ boundary.

Graphs also highlight the positive impact on compliance through Palmerston Place, Randolph Crescent and Great Stuart Street resulting from the Revised LEZ boundary via Charlotte Square.

Figure 4.14: AM comparison of compliant and non-compliant vehicles by diversion street and assessment year

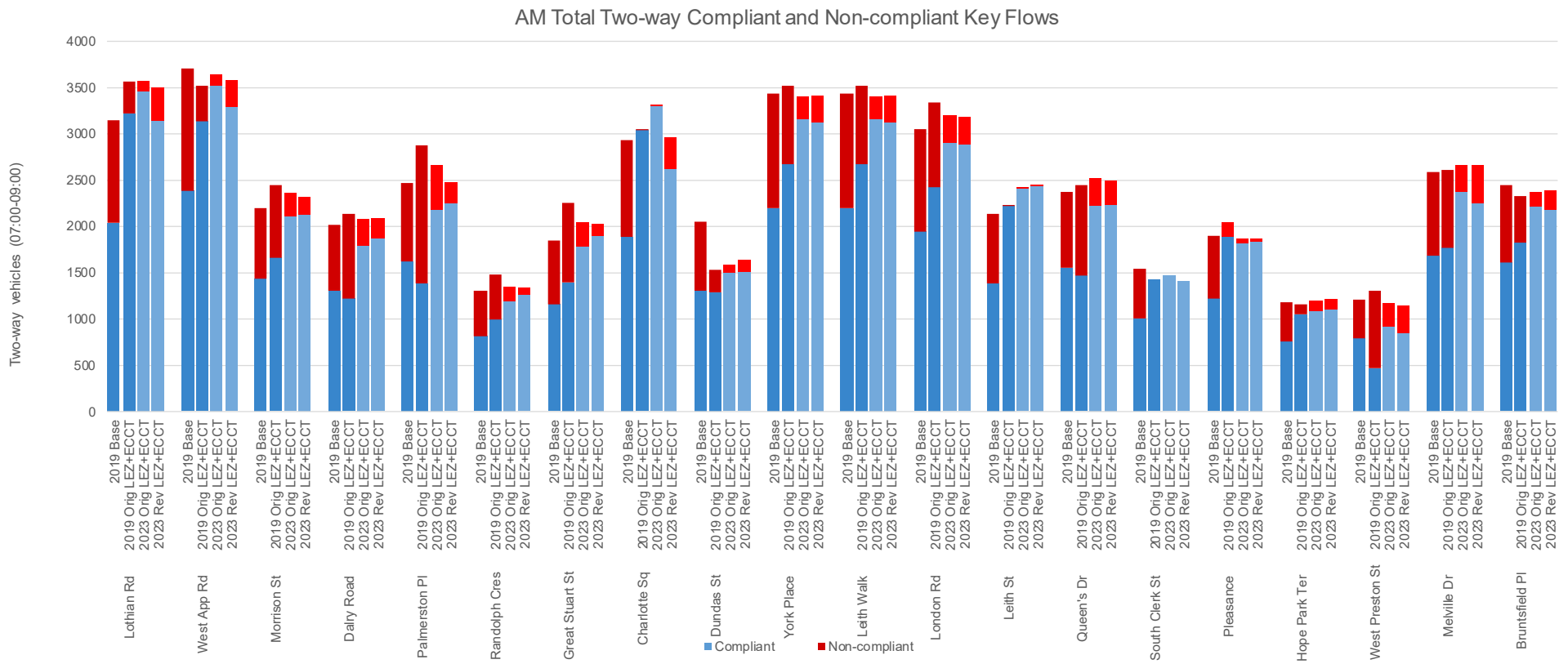


Figure 4.15: IP comparison of compliant and non-compliant vehicles by diversion street and assessment year

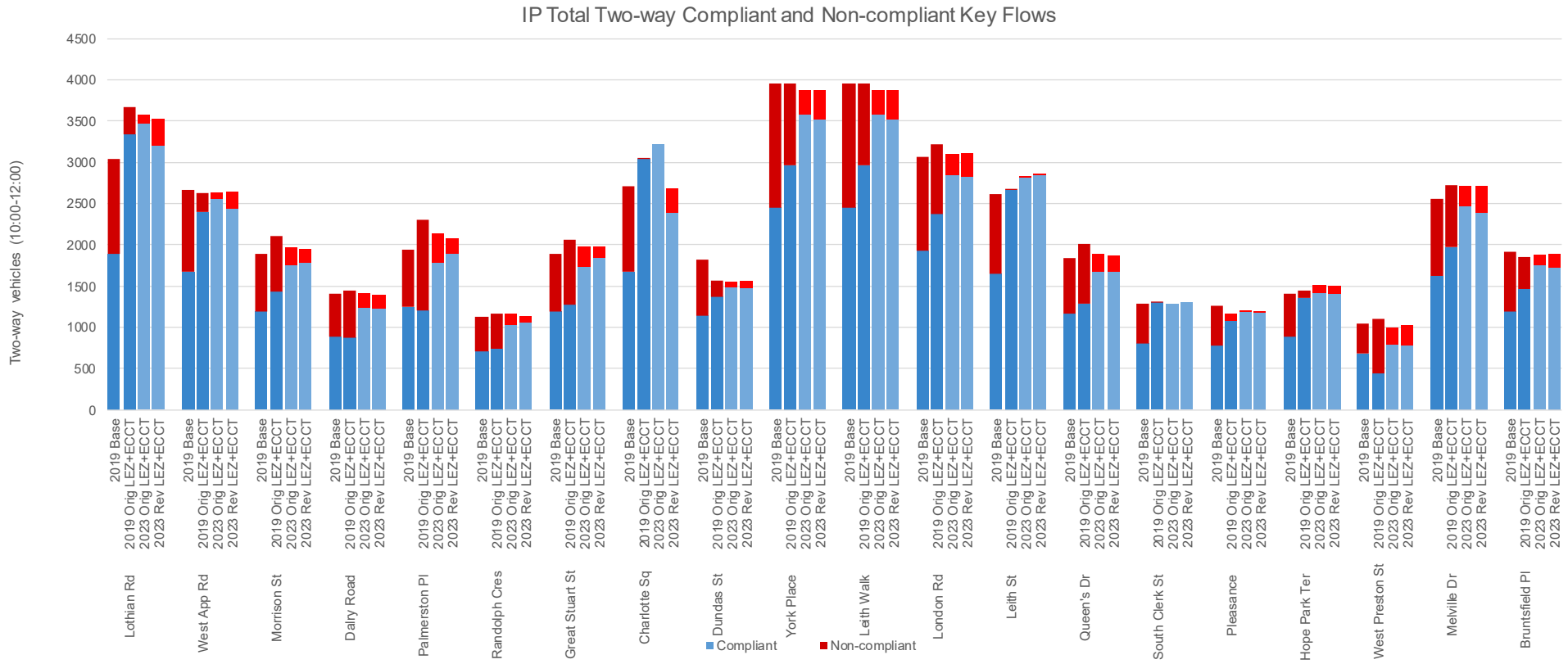
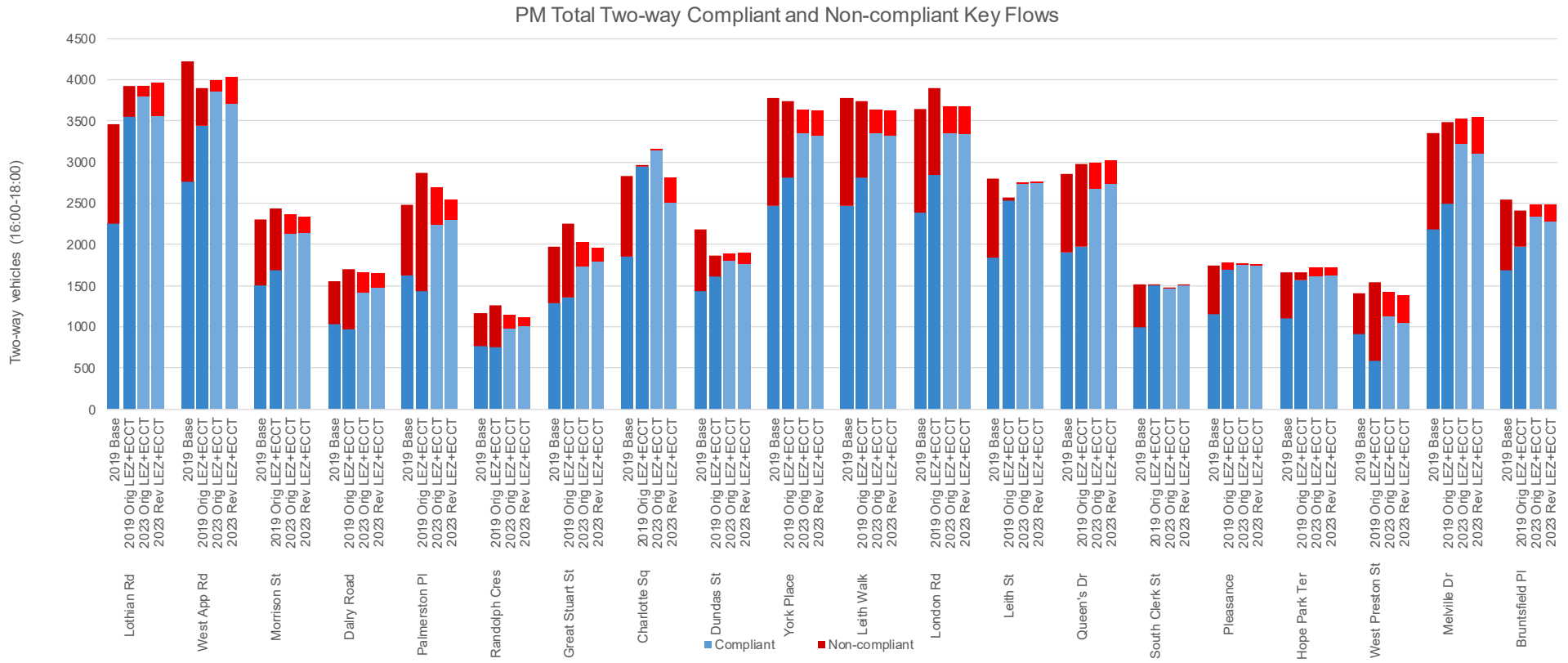


Figure 4.16: PM comparison of compliant and non-compliant vehicles by diversion street and assessment year



4.6 Assignment Summary Plots

Figure 4.17 to Figure 4.24 below illustrate link flows for the Base and Scenario models, in the morning and evening peaks. Compliant vehicles are shown in Blue, non-compliant vehicles are shown in Red.

The general pattern by time period is similar and the assignment; however, the 2023 forecast year plots highlight the significant reduction in non-compliant vehicles across the network.

The impact of the revised LEZ boundary (via Lothian Road and South Charlotte Street) with 2019 compliance rates is shown in Figure 4.25 and 4.26 for the morning and evening peaks respectively. Figures 4.27 and 4.28 highlight the reduced levels of diverted traffic resulting from 2023 vehicle compliance.

Figure 4.17: AM (07:00-09:00) Original LEZ (no ECCT) – 2016 traffic volumes and 2019 fleet composition

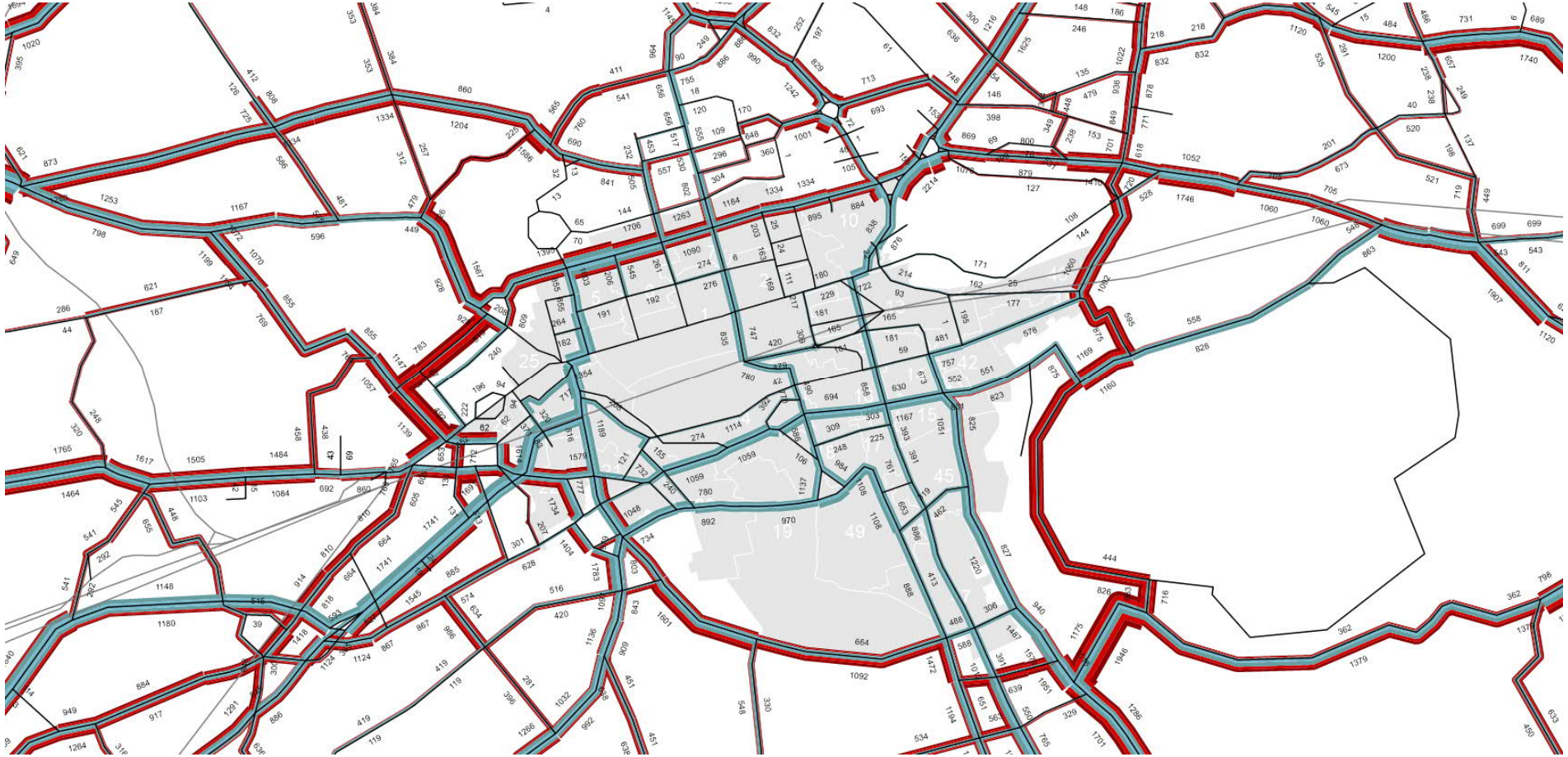


Figure 4.18: AM (07:00-09:00) Original LEZ + ECCT – 2016 traffic volumes and 2019 fleet composition

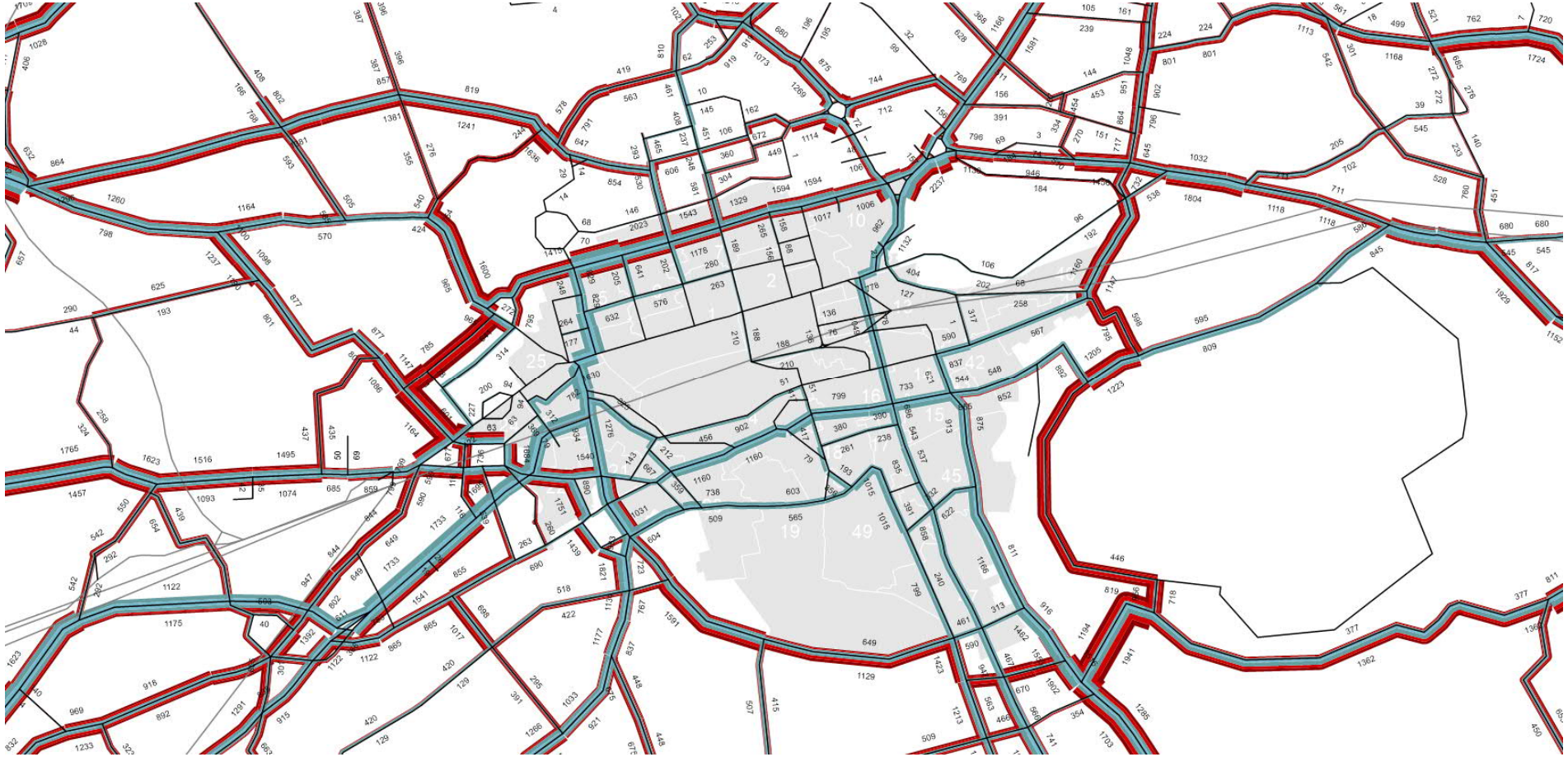


Figure 4.19: PM (16:00-18:00) Original LEZ (no ECCT) – 2016 traffic volumes and 2019 fleet composition

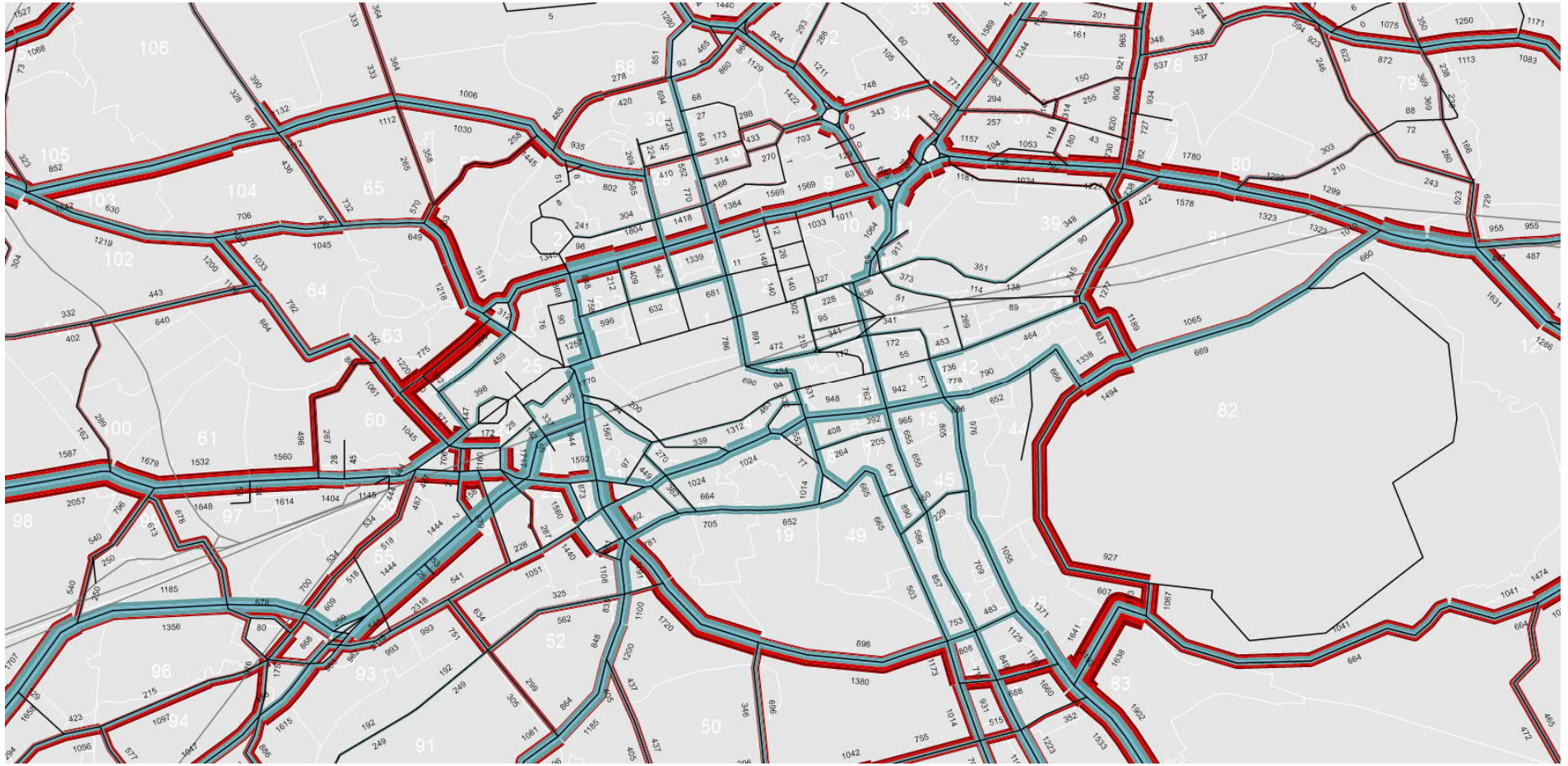


Figure 4.20: PM (16:00-18:00) Original LEZ + ECCT – 2016 traffic volumes and 2019 fleet composition

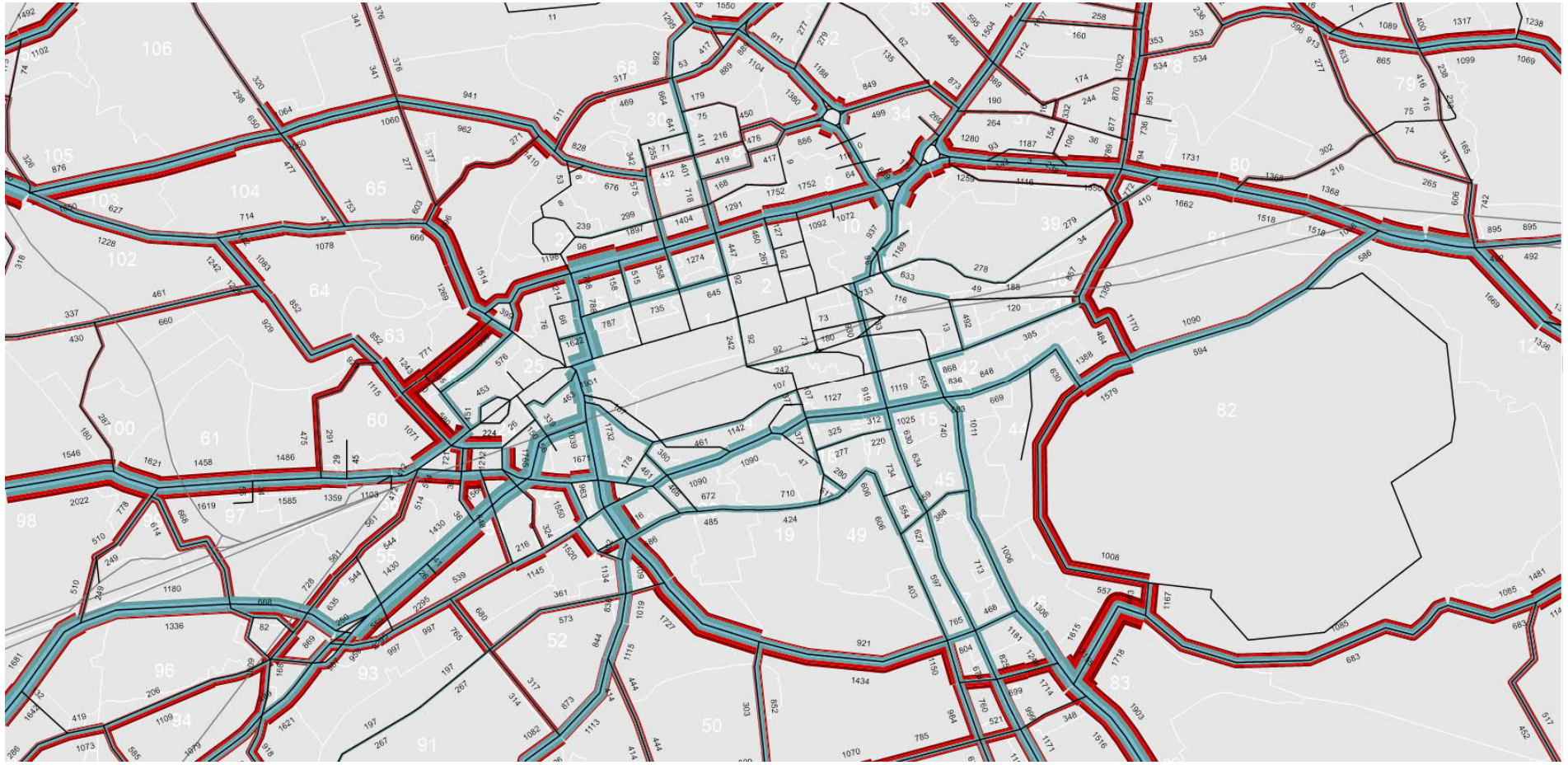


Figure 4.21: AM (07:00-09:00) Original LEZ (no ECCT) – 2016 traffic volumes, 2023 fleet composition

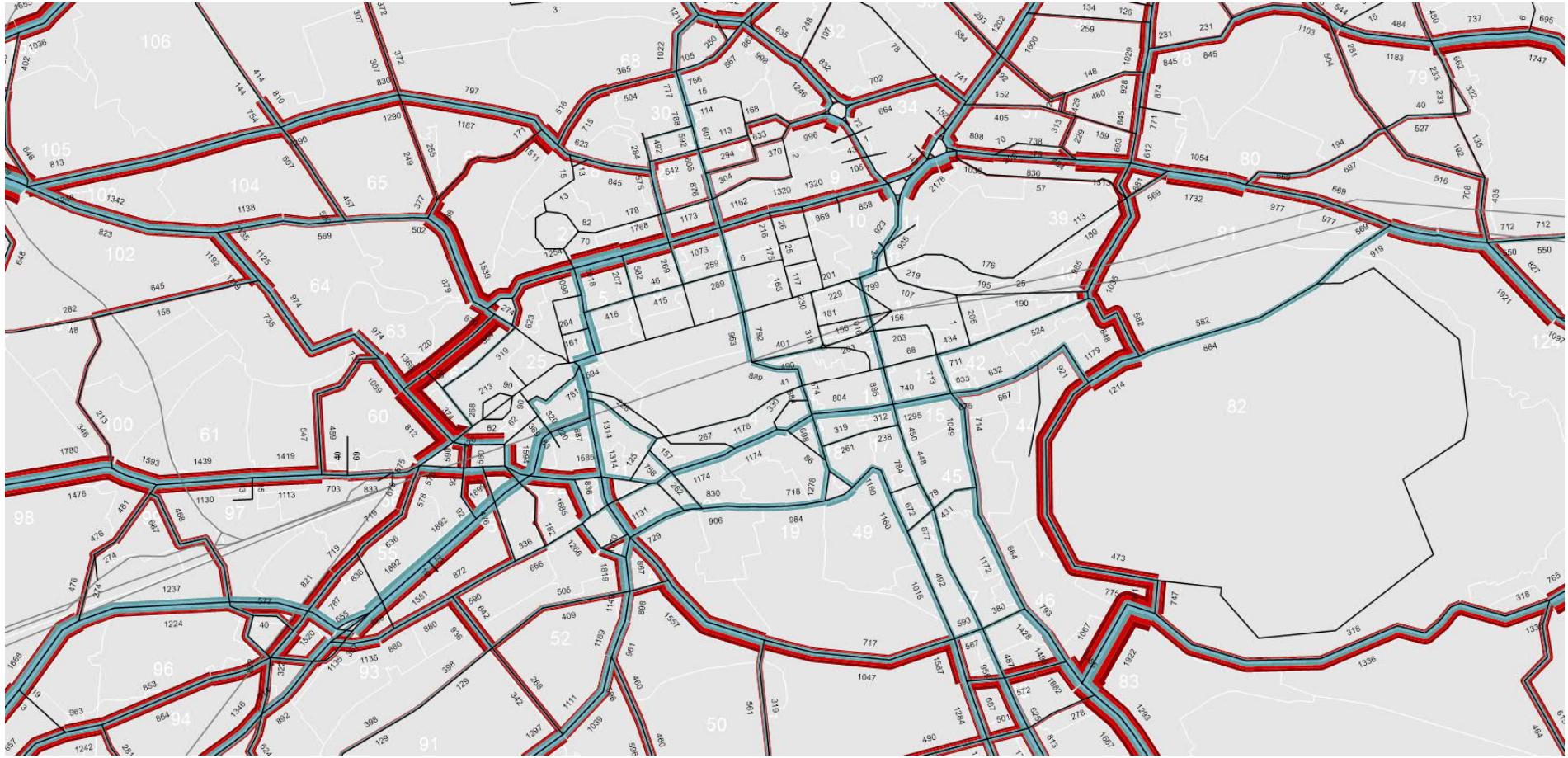


Figure 4.22: AM (07:00-09:00) Original LEZ + ECCT – 2016 traffic volumes, 2023 fleet composition

Figure 4.23: PM (16:00-18:00) Original LEZ (no ECCT) – 2016 traffic volumes, 2023 fleet composition

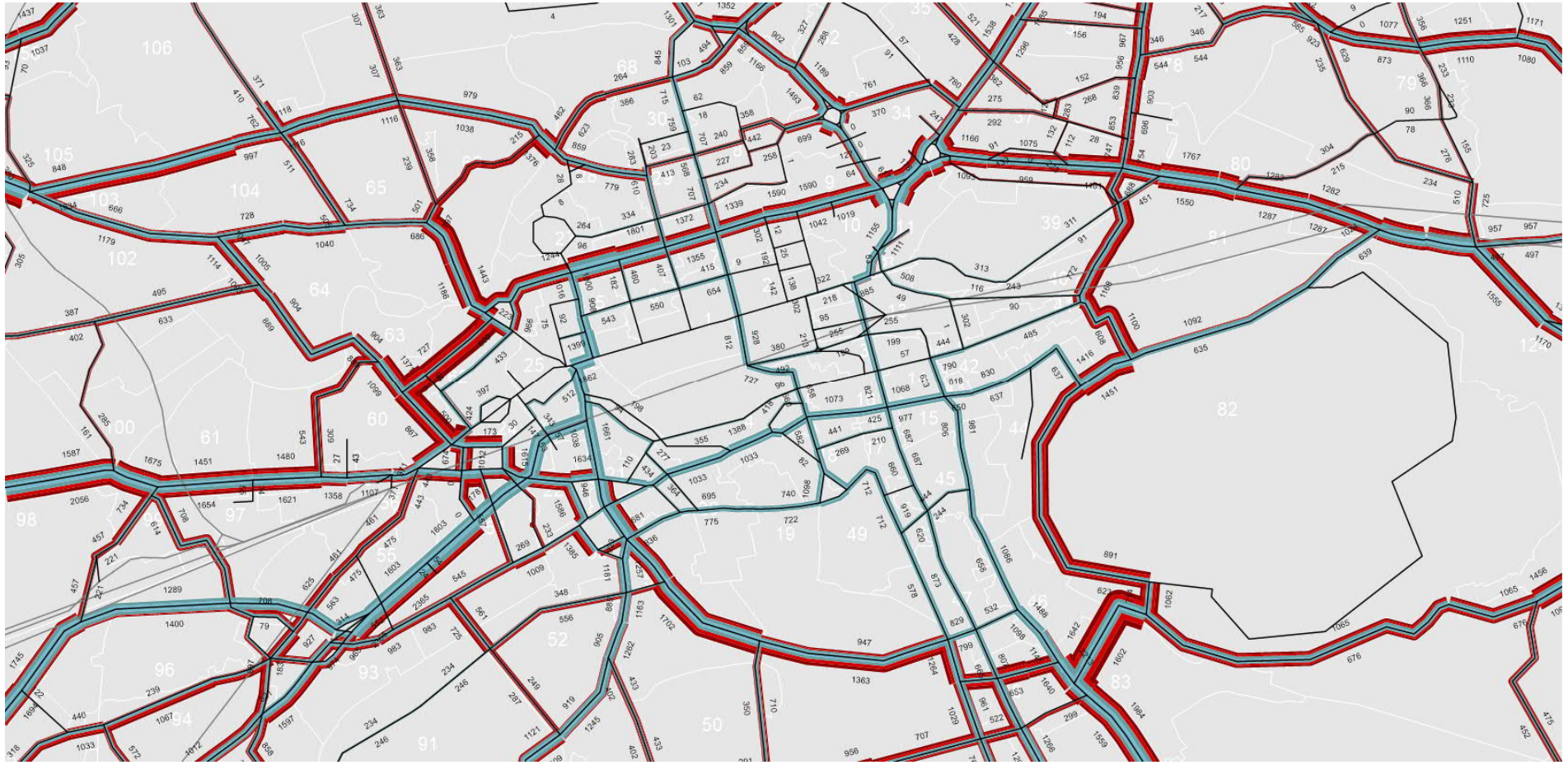


Figure 4.24: PM (16:00-18:00) Original LEZ + ECCT – 2016 traffic volumes, 2023 fleet composition

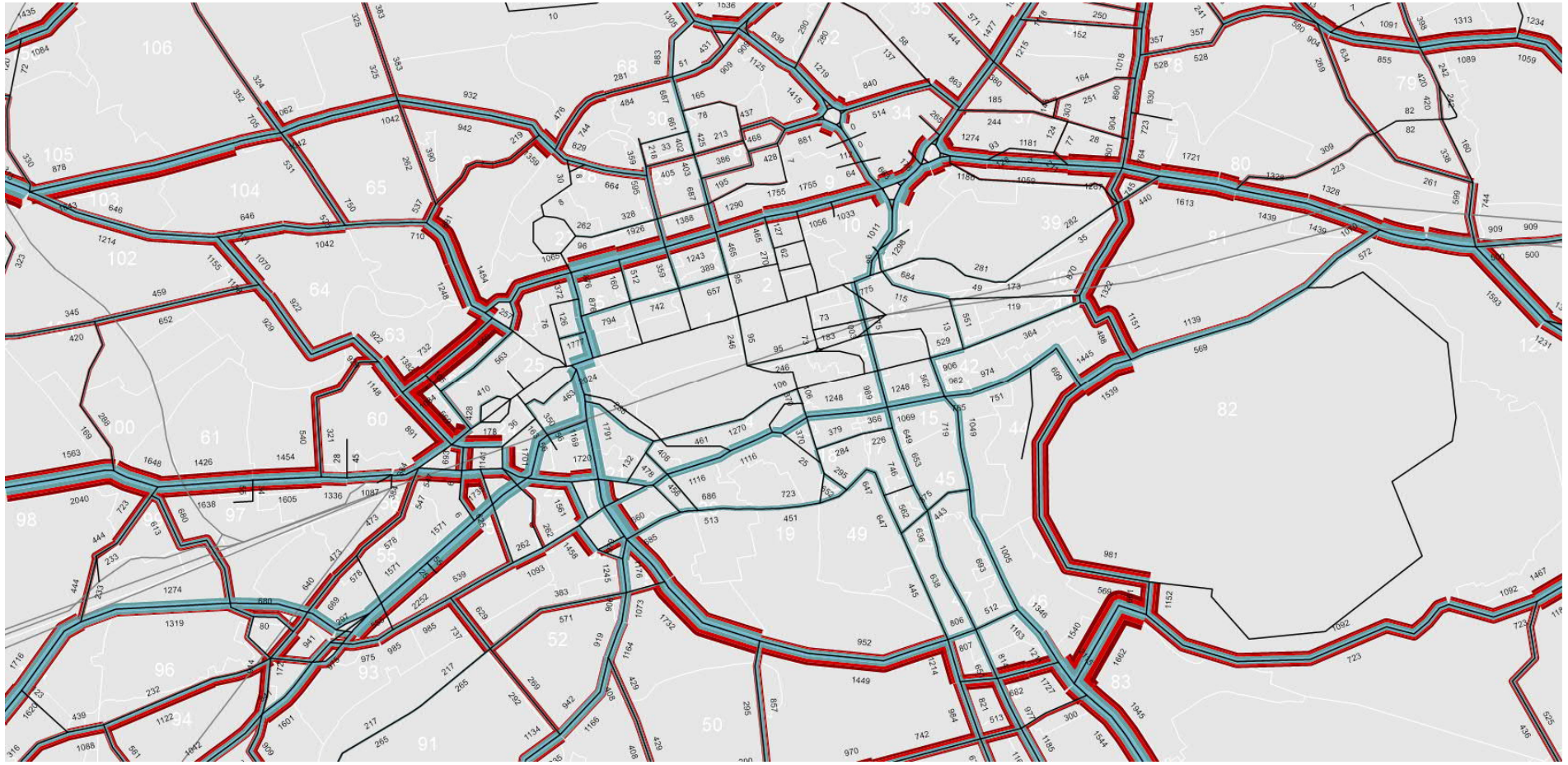


Figure 4.25: AM (08:00-09:00) Revised LEZ + ECCT – 2016 traffic volumes, 2019 fleet composition

Figure 4.26: PM (17:00-18:00) Revised LEZ + ECCT – 2016 traffic volumes, 2019 fleet composition

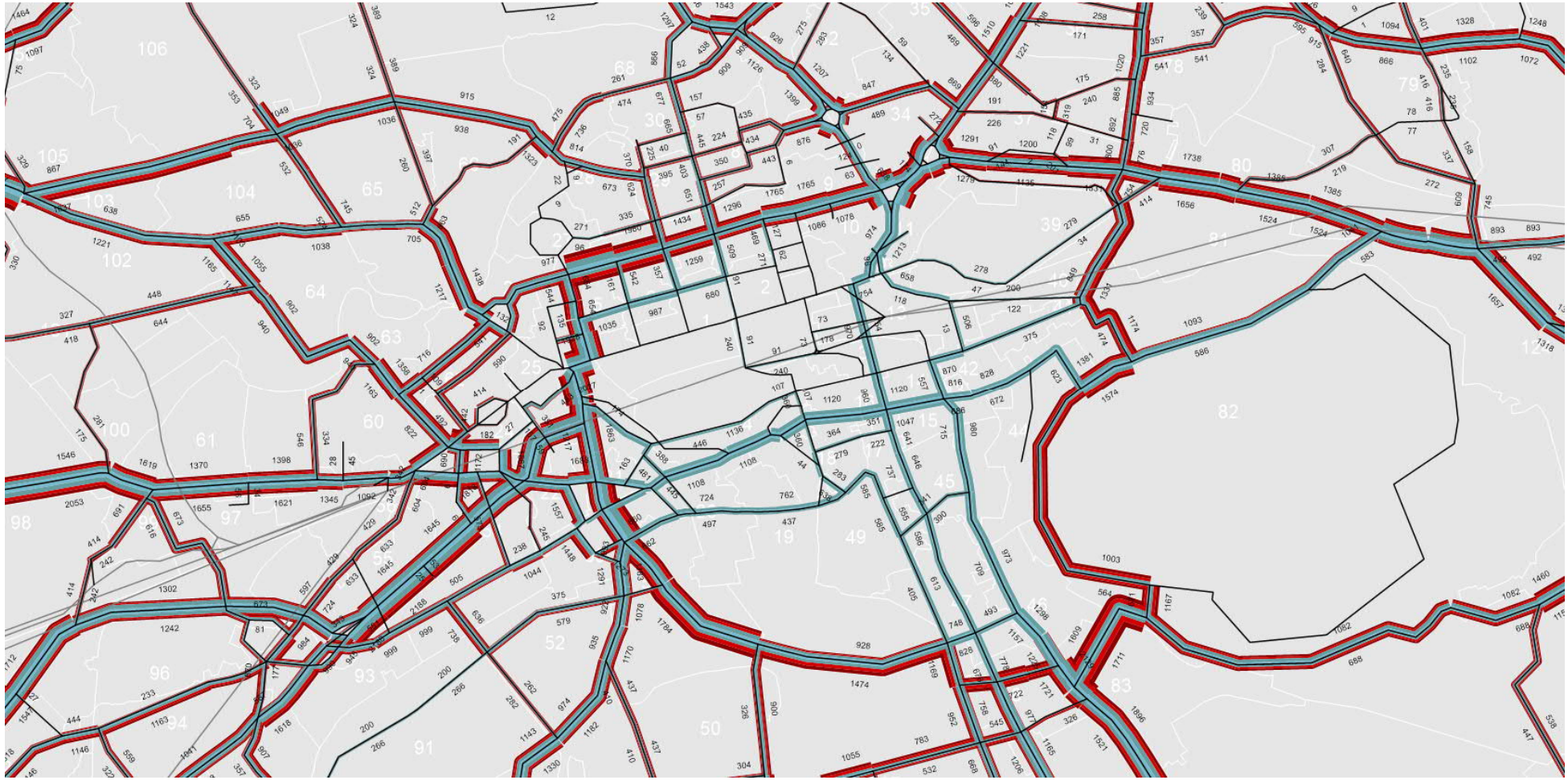
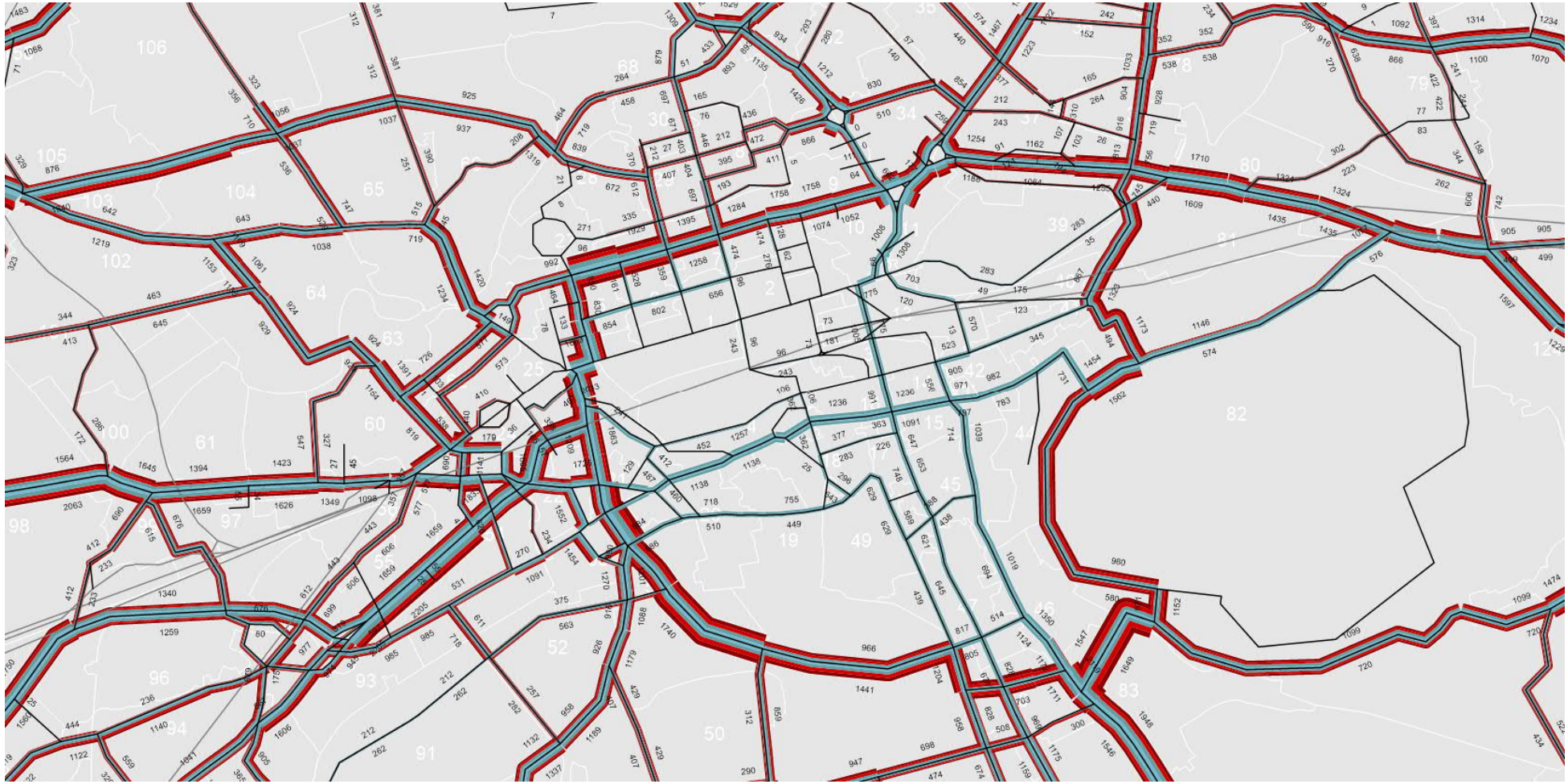


Figure 4.27: PM (17:00-18:00) Revised LEZ + ECCT – 2016 traffic volumes, 2023 fleet composition

Figure 4.28: PM (17:00-18:00) Revised LEZ + ECCT – 2016 traffic volumes, 2023 fleet composition



5. Summary

5.1 Summary

This report summarises the traffic modelling undertaken to assess the impact of the Low Emission Zone (LEZ) proposed for Edinburgh city centre.

Four alternative scenarios have been considered:

- Base
- Original LEZ
- Original LEZ + City Centre Transformation schemes
- Alternative LEZ + City Centre Transformation schemes

Two forecast years have been assessed – 2019 and 2023. Both use 2016 VISUM flows, as agreed with SEPA, so that any change in assignment is a result of changes in fleet mix rather underlying travel patterns.

The base year fleet composition has been updated from previous work, based on summer 2019 ANPR data. The key difference between 2016 and 2019 data is a much higher level of observed LGV compliance. Car matrices have been disaggregated by petrol and diesel engine types in order that the air quality model can more accurately calculate emissions by compliant and non-compliant traffic.

All vehicles with an origin or destination within the city centre are assumed to be compliant with LEZ legislation. In addition, non-compliant vehicles which would previously have routed through the city centre now route around the LEZ boundary.

With a 2019 fleet composition, a number of streets are especially affected by the proposals including Palmerston Place, Chester St, Randolph Crescent and St Colme Street along the north west of the boundary. There are also impacts around Queens Drive and Hope Park Terrace to the east and south east respectively.

Implementing the alternative LEZ boundary via Lothian Road and Charlotte Square removes the impact of the scheme on Randolph Crescent and Great Stuart Street, although the size of the city centre controlled area is necessarily reduced.

It may be appropriate to implement the alternative boundary initially and expand coverage over time. A preferred approach to mitigation at key air quality hot-spot locations around the LEZ boundary will be informed by the SEPA air quality modelling which is currently being undertaken.

By 2022, ECCT interventions, including the Meadows to George St scheme, result in an increase in traffic around the periphery of the boundary. Nevertheless, a cleaner fleet means that the number of vehicles which do not meet the LEZ criteria is lower than in the base across all links analysed.

Boundary streets benefit both from cleaner vehicles and the fact that a larger number of movements are possible through the LEZ area. Nevertheless, a number of locations remain a concern and air quality analysis will help identify whether there are remaining exceedances which require further assessment and mitigation.

BRIEFING NOTE

LEZ POST-COVID UNCERTAINTY

LEZ UNCERTAINTY SUMMARY NOTE

IDENTIFICATION TABLE	
Client/Project owner	Transport Scotland
Project	LEZ Post-Covid Uncertainty
Title of Document	LEZ Uncertainty Summary Note
Type of Document	Briefing Note
Date	28/01/2021
Reference number	GB01T20E86/11024112/005
Number of pages	56

TABLE OF CONTENTS

1. EXECUTIVE SUMMARY

1.1 Aims and Objectives

1.1.1 The Covid-19 pandemic has had a dramatic impact on travel across all modes and specifically travel in Scotland's city centres. As the Low Emission Zone (LEZ) designs are currently progressing across the four cities; Glasgow, Edinburgh, Dundee and Aberdeen, further evidence is required by applying the principals of modelling to consider the uncertainty over what travel will look like after the pandemic has ended. This evidence will help inform decision makers for the LEZ schemes.

1.1.2 A key focus is to understand the uncertainty faced by the cities in a post-Covid environment and how policies required to address these could interface with LEZ proposals. The aim is to set out a framework for embracing uncertainty by consulting with stakeholders on 'what will travel look like post COVID-19'. This framework sets out the rationale for any additional modelling required to provide supporting evidence relating to uncertainty which would enhance the acceptability of the modelling work undertaken to date.

1.2 Scenario Planning Workshops

1.2.1 To assist this process, workshops were held with the respective authorities to agree the key metrics to measure against the current LEZ objectives and Identify the key disruptors which are likely to have the greatest impact on travel activities within each city centre.

1.2.2 The agreed output metrics informed from the stakeholder workshops are the change in emissions and traffic volumes as a result of the LEZ. A review of the disruptors for each city combined with the discussions surrounding them within the workshops concluded with a generic list including commute travel demand and changes in fleet composition.

1.3 Uncertainty (Scenario Planning)

1.3.1 The Scenario Planning Process allows a range of plausible future scenarios to be defined using important and likely disruptors. These scenarios, or a subset of, are used as a reference case where a scheme or in this case, the LEZ, is applied to understand how it performs in the context of each scenario.

1.3.2 The impact of the LEZ is quantified by understanding and predicting the impact (quantitative or qualitative) it will have on each scenario. The Scenario Planning Tool quantifies the impact of the LEZ scheme and the metrics from the Scenario Planning Tool are then translated back into an output narrative to complement the input narrative.

1.3.3 A total of 40 plausible future scenarios were created which was sifted to four concise scenarios encompassing a range of emissions and trip making relationships shown below. Each scenario provides an insight into what a future could look like in terms of differing outcomes. The narrative which defines the four plausible futures are:

- A1: 'Bounce Back' - Increased commuting and retail travel demand, improved bus operations and more buoyant economy along with a suppressed enthusiasm for compliant vehicles.
- H4: 'Coping as Best We Can' - A poorly performing economy results in delayed infrastructure investment, a lack of shift to healthier modes and fleet, and a lack of appetite for additional air quality measures

- G1: ‘Brave New World’ - Following Covid there has been a reduction in office space which has transferred to other uses. With this a general reduction in traffic in the city centre for both commuting and shopping, however the uptake in compliant vehicles continues.
- B4: ‘It Could Have Been Worse’ - Increased retail travel demand resulting in increased congestion however public appetite for further Air Quality measures, which supports further policy shift towards more sustainable measures including a zero-Carbon fleet.

1.3.4 The outcome of testing the LEZ against each future is summarised below.

- Scenario A1 ‘Bounce Back’: With the introduction of the LEZ the volume of non-compliant vehicles have reduced which has demonstrated a marked improvement in the NOX levels within the city centre however, traffic will re-route around the city centre. The volume of vehicles within the LEZ area has reduced and active travel has increased as a result.
- Scenario H4 ‘Coping as Best We Can’: The LEZ has reduced the emissions within the LEZ area to an acceptable level however there is still re-routeing vehicles. The reduction in vehicular traffic has reduced below current levels however limited active travel increases have been achieved.
- Scenario G1 ‘Brave New World’ & B4 ‘It Could Have Been Worse’: The emission levels are still at acceptable levels with little change as a result of the LEZ scheme.

1.3.5 Whilst the LEZ may achieve a consistent goal in terms of NOX emissions, it is important to understand that the consequences of a LEZ may vary e.g. re-distribution of traffic effects.

1.4 Conclusions & Recommendations

1.4.1 This process demonstrates that the impact of the Low Emission Zones will vary between each city depending on their specific traffic levels and fleet composition. But importantly, the LEZ will protect the city centres by preventing non-compliant vehicles from entering them. Whilst the impact of the LEZ may vary across each city in terms of NOX emissions, the outcome is likely to be very similar with the level of emissions limited to a reduced value compared to pre-LEZ levels.

1.4.2 For each of the four LEZ cities, the four identified plausible futures have been considered against the model assessments undertaken to date. From this, to address uncertainty, further sensitivity testing of the proposed LEZ schemes is proposed. Each city has different characteristics and strategies which defines the further testing and the sensitivity tests are to be consistent with the core testing background scenario year (2022-2024).

1.4.3 The objectives of undertaking the proposed sensitivity tests are to provide evidence that the LEZ schemes are robust to variations in network conditions that may occur in a post-pandemic world. Each city may undertake different sensitivity scenarios, but they will have all considered plausible futures under a consistent framework.

2. INTRODUCTION

2.1 Aims and Objectives

2.1.1 The Covid-19 pandemic has had a dramatic impact on travel across all modes and specifically travel in Scotland's city centres. As the Low Emission Zone (LEZ) designs are currently progressing across the four cities; Glasgow, Edinburgh, Dundee and Aberdeen, further evidence is required by applying the principals of modelling to consider the uncertainty over what travel will look like after the pandemic has ended. This evidence will help inform decision makers for the LEZ schemes.

2.1.2 Jacobs and SYSTRA have been commissioned by Transport Scotland to prepare a report on key drivers of uncertainty and narratives around plausible futures. A key focus is to understand the uncertainty faced by the cities in a post-Covid environment and how policies required to address these could interface with LEZ proposals. The aim is to set out a framework for embracing uncertainty by consulting with stakeholders on 'what will travel look like post COVID-19'.

2.1.3 This framework sets out the rationale for any additional modelling required to provide supporting evidence relating to uncertainty which would enhance the acceptability of the modelling work undertaken to date.

2.2 Stakeholder Workshops

2.2.1 To assist this process, workshops were held with the respective authorities with the following objectives:

- Agree the key metrics to measure against the current LEZ objectives
- Identify the key disruptors which are likely to have the greatest impact on travel activities within each city centre.

2.2.2 The Dundee, Aberdeen and Glasgow workshops were chaired by Vincent McInally (Transport Scotland) with Boris Johansson and Malcolm Neil (SYSTRA) acting as workshop facilitators. The Edinburgh workshop was chaired by Vincent McInally (Transport Scotland) with Keith Gowenlock and Grant Davidson (Jacobs) acting as workshop facilitators.

2.2.3 The team would like to thank all attendees for their participation in what were very constructive and collaborative sessions.

2.2.4 Following the workshops, the information received was collated and used to inform a scenario planning exercise. This process defined a series of future scenarios, which were sifted down to a manageable number. The current Low Emission Zone concept was tested against the various futures to understand if the scheme still meets its objectives.

2.2.5 The workshop attendees and organisation/groups they were representing are tabulated in Appendix A.

2.2.6 The agenda followed the following format:

- Introduction
- Scene setting
- Output measures

- Input drivers
- Summing up, reflections and next steps

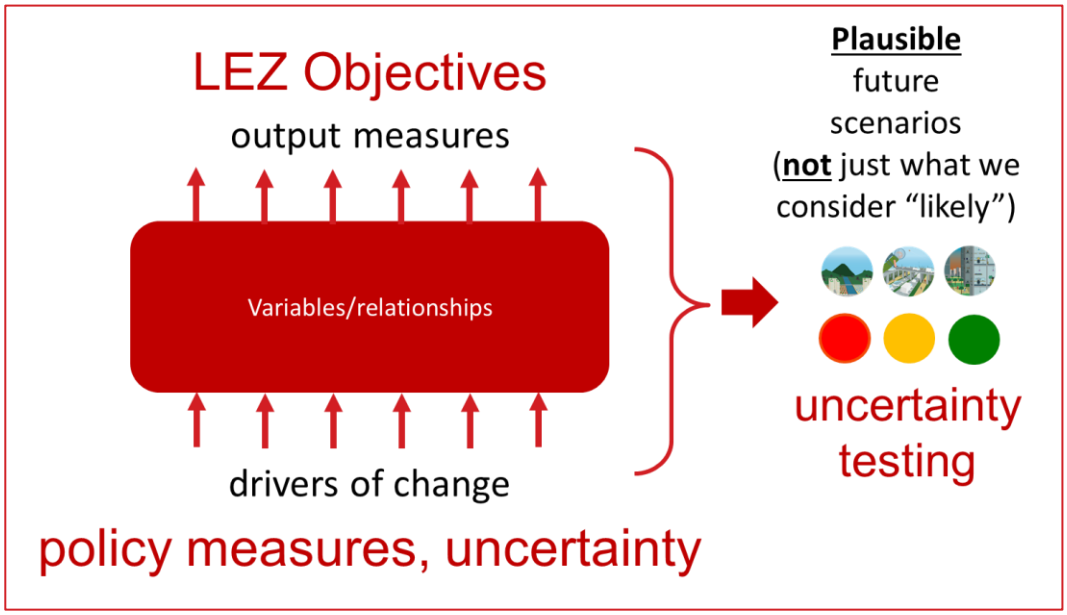
2.3 Scene Setting

2.3.1 The scene setting to the workshop was provided with an introduction to the objectives of the exercise:

> 'To understand:
>
> The issues faced by cities in a post-Covid-19 environment over the next 5 (or so) years
>
> How policies required to address this interface with LEZ proposals
>
> To inform decision makers and assist with potential future examination'

2.3.2 Throughout the presentation, the following was also highlighted:

- The process is embracing uncertainty by consulting with key stakeholders on 'what travel could look like post-Covid-19'
- The same questions are being asked across all cities
- A degree of consensus is being sought on the key metrics and disruptors to enable post-Covid plausible future scenarios to be derived, whilst exploring any key variations between the cities that would need to be taken into account.
- Traditional modelling of these futures is too time consuming so a simplified process will be developed
- This process will cut back on the richness of detail but run times are significantly reduced
- Further modelling may or may not be required to investigate impacts of one or more scenarios.



2.3.3 To summarise:

- Input drivers and output measures need to be quantifiable and may reflect proxies for more complex aspects of transport and society

- The scenario planning process's purpose is the development of richer interpretation of future states through stakeholder dialogue
- The process should not feel constrained by a focus upon only the scenario planning process. Focus should be upon the envisaged needs (i.e. the wider process).

3. OUTPUT METRICS

3.1 Introduction

3.1.1 As an introduction to the first session, workshop attendees were reminded that, for the output metrics:

1. A manageable number of output metrics are needed that best help inform judgement of the consequences of policy measures and contribution towards National Transport Strategy (NTS) outcomes
2. The more output metrics there are, the greater the likely number of input drivers that would be needed
3. Output metrics may themselves be interrelated and ordered – e.g. traffic levels impacting upon air pollution impacting upon public health.

3.1.2 For each workshop the relevant LEZ objectives were presented as a reminder. These objectives are set out in Table 1.

Table 1. LEZ Objectives by City

CITY	OBJECTIVES
Dundee	Primary Objectives: • Protect public health through improving air quality in Dundee and achieving air quality compliance for NO2, PM10 and PM2.5 • Develop an environment that helps to promote more active and sustainable travel choices in Dundee • Contribute to the ongoing transformational change in Dundee and help promote the city as an inclusive and desirable place to live, invest, visit and learn
Aberdeen	Primary Objectives: • Improve air quality in Aberdeen by reducing harmful emissions from transport and delivering on the Scottish Government's statutory air quality objectives. • Support climate change targets by reducing road transport's contribution to emissions. Supplementary Objectives: • Protect public health and wellbeing; • Support local and regional transport strategies by contributing to the development of a vibrant, accessible, and safe city centre, where the volume of non-essential traffic is minimised and active and sustainable transport movements are prioritised; and • Contribute to ongoing transformational change in Aberdeen, helping promote the city as a desirable place to live, visit and invest in.
Edinburgh	Primary Objectives: • Achieve air quality compliance • Use an evidence-based approach to identify interventions that reduce impact of air pollution on human health • Reduce congestion, promote sustainable forms of transport, and achieve placemaking outcomes across Edinburgh
Glasgow	Primary Objectives: • Protect public health through tackling poor air quality in the city centre • Ensure that Glasgow moves more rapidly towards meeting Scottish and EU air quality objectives for nitrogen dioxide and improve air quality standards within the city • Contribute to broader objectives and vision by the City Government to lower vehicle emissions and promote active travel, thereby improving urban liveability and supporting a vibrant and thriving city centre offer to residents, visitors, business and tourists

3.1.3 The output metrics, identified from the modelling work that had been undertaken to date, were presented at each workshop as detailed in Table 2.

Table 2. Output Metrics

CITY	OBJECTIVES
Dundee, Aberdeen, Edinburgh, Glasgow	○ Change in emissions in the LEZ area: ● NOX / PM / CO2 (from AQ Modelling) ○ Change to traffic volume (every vehicle classification)

3.2 Discussion

3.2.1 The stakeholders were offered an opportunity to discuss the output metrics which is summarised below for each city workshop. Naturally, the discussion did consider other related topics and the key elements have been summarised in the notes below for completeness.

Dundee

Objectives have climate change element due to changes in the Transport Act. An additional objective was added to help meet the climate change programme.

'Develop an environment that helps promote more active and sustainable travel choices in Dundee and contributes to meeting emission reduction targets set out in Part 1 of the Climate Change (Scotland) Act 2009'.

Data collected in Glasgow focused on NOXs and CO2. Initial LEZ objectives was air quality improvements but CO2 is a useful metric. It is important to include traffic volume as well. LEZ objectives are primarily focused on air quality objectives and not necessarily to climate change. The air quality metric is local and Carbon is a globalised metric. The primary focus is the air quality. If we ignore carbon then this could increase as a result changes to the travel patterns.

Are we aiming to identify what the outcomes are e.g. high and low? Do we want to identify the future we want? This will be discussed in the disruptors session.

We should consider specifically the bus service changes (volumes) and the economic impacts on the city centre. Again this can be discussed in the disruptors session.

Could the output measures have layers to enhance the metrics relevance to the LEZ. For example, could we measure the total number of people going into and out of Dundee City Centre e.g. by mode?

In summary is that there is no significant change in the metrics proposed.

Aberdeen

Have we distinguished between the output and outcomes? Yes, we deal with this through the narrative.

There is a link between the LEZ and the wider economy. Should there be wider economic measures? Are there specific outputs which relate to the economy? Aberdeen is an international energy city. We need to consider that there may not be a link between economy and traffic volumes, when considering Aberdeen City Centre as a place. Reference to the economy would be covered in the narrative of each scenario.

What will a post Covid world look like with the significant reduction in Public transport (PT) usage?. The scenarios will look at plausibility when looking at future scenarios.

The city centre is the major pollution hot spot and Aberdeen City Council have been progressing an LEZ scheme. These have been public consultation on different options and hope to committee in 2021 working towards a final scheme in 2022.

The assessment is mainly considering the car and HGV vehicle fleet and it is anticipated that this will be an all-vehicle LEZ although other option may be considered.

The significant drop in bus patronage levels should be captured within this exercise.

Edinburgh

LEZ will be implemented in 2022 with enforcement from 2023. The focus is around a 5 year horizon – 2025, therefore there is a need to consider short / to medium term disruptors.

The economic impact – How would this be measured?. Businesses will see the LEZ as detrimental, but more enlightened businesses will see the benefits of a healthy and clean environment. How do we quantify against the measures?. Qualitative survey of businesses.

How will footfall be affected?– the number of people coming into the city centre.

Annual survey – monitoring the number of people coming into the city centre so that you can understand the wider impacts of LEZ. Success factors – is it being successful in driving people on to bus / active travel? It does need to be a monitoring exercise – work ongoing will help understand success factors.

Think about mode split and proportions. Impact of Covid – 50% of employment within region in the city, acceleration in changes in retail. Maybe not quite as busy as before. Might skew impacts of monitoring. i.e. a reduction in footfall is due to Covid and changing retail, not the LEZ.

Demand level, Covid has had a significant impact. Do we still need an LEZ, will air quality still be an issue? Need to justify why we are proceeding with an LEZ.

Covid scenarios – potential reduced PT.

Need to consider fleet composition. Fleet turn-over slowdown so improvements take place more slowly or else a reduced fleet size means the withdrawal of older vehicles. Could go either way.

Important to reference a no LEZ scenario.

Fleet composition – an output or an input to the different scenarios.

Other views from different groups – business, equality.

Total travel demand – similar if not more, albeit by different modes.

Only a third of particulates come from the exhaust pipe. Diesel and electric cars are heavier, increasing tyre wear. Making the fleet cleaner is important, but there is a need to reduce traffic volumes as well.

Glasgow

Should the LEZ parameters be reviewed as a result of the pandemic? If we are successful in reducing emissions to acceptable levels, can the restrictions be extended further? We still need a scheme to implement with the current fleet/emissions. We should consider the future changes and how they impact on the case for the LEZ.

LEZ useful to ringfence the City Centre. We need to consider what is throttling the use of new initiatives. Considering normal working patterns, should we look at transition points such as travel hubs and parking strategies?.

The LEZ main purpose is to reduce NOX emissions and we need to meet the transport targets. Euro 3 buses will have to be replaced as they cannot be retro-fitted. Meeting Euro 6 bus fleet needs significant investment from the bus companies. The movement towards low emissions targets requires a number of initiatives.

Is the LEZ out of date with the new emerging technologies? Do we have the opportunity to move to zero emission zones? Do we review in the future or introduce more stricter restrictions?. At this time, there is no mechanism to introduce zero emission zones although there are discussions on this concept. There is still a case for the LEZ and it is acknowledged that the future is uncertain post-Covid with journeys to work and retail. There is a risk of challenge if uncertainty has not been considered.

GCC have been working with the taxi fleet to meet the LEZ requirement. With taxi being small businesses this is a huge investment and they have been hit hard post-Covid. Taxi fleet is needed to transport vulnerable users, so they are essential to the public transport network.

Given the unprecedented improvement in air quality during travel restrictions, could we increase the standards that are required to improve air quality?. This improvement could be short lived as the restrictions are lifted.

Complimentary measures will be needed to support the LEZ to reduce travel into the city centre. This improves the city centre environment and maintains high air quality.

3.2.2 The resulting output metrics that have been informed from the stakeholder workshops and the consultants involved in the LEZ business case activities are presented in Table 3. This includes Carbon which is a requirement of the Transport Act and recognises the importance of all people including active travel trips travelling into and within the city centres.

Table 3. Output Metrics

CITY	METRICS
Dundee, Aberdeen, Edinburgh, Glasgow	○ Change in emissions in the LEZ area: ● NOX / PM ● Carbon ○ Change to traffic volume: ● Active Travel ● Cars ● Taxis ● LGVs ● HGVs ● Buses

4. INPUT DISRUPTORS

4.1 Scene Setting

4.1.1 As an introduction to the second break-out session, workshop attendees were reminded that for the input disruptors:

- The drivers of change of immediate interest are those disruptors that most influence the output measures that we prioritise
- Some disruptors will be external e.g. population change, and others will be internal i.e. within the control or influence of the Council. This process considers more of a spectrum ranging from truly external to ones totally in control of council with many being a combination of both
- Some disruptors will be more uncertain than others
- Some candidate disruptors are themselves a product of others e.g. an increase in e-shopping and an increase in homeworking contribute as drivers of declining person trip rate
- It is helpful to have confidence that some evidence exists concerning how a disruptor's value has been changing over time to date (and any existing attempts to project forward in time).

4.1.2 The initial list of drivers presented are shown in Table 4.

Table 4. Initial Disruptors

CITY	DISRUPTORS
All 4 Cities	• Travel demand to/from existing premises – commute (e.g. reduced employment) • Travel demand to/from existing premises – commute (e.g. more home working) • Car travel demand to/from existing premises - shopping (e.g. more on-line and out-of-town shopping) • Impact on proposed bus fleet upgrades (existing fleet conversions) • Bus users switch to private car • Impact on bus patronage (related to social distancing factors) • Public appetite for Air Quality measures post-Covid?

4.2 Discussion

4.2.1 Throughout the workshops, there were periods of collective discussion on what the future may look like and the associated factors that could influence a particular outcome. In the same vein, there was also an insight into the future which stakeholders wanted to see.

4.2.2 These discussions were important in understanding the sort of futures which appear plausible and the factors, outside transport, which may influence them. Below is a summary of the observations from each group.

Dundee

Travel Demand to and from existing premises – commute. It's not just reduced employment it's a change in use or type of shops. There will be change in the city centre but uncertain what form it will take. Within the council, there is a drive to working from home and this has been accelerated and will continue. The type of employment may change .e.g. the percentage of office employment differs across different cities e.g. Edinburgh ~42% and Dundee ~20%. People working from home impacts on footfall in city centre.

People who work closer to work will be more inclined to commute and those further away will commute less/work from home more.

DCC has an objective to increase the number of people living, working and visiting Dundee. How this materialises is unknown. There could be increased residential within City centres to help improve the vitality of the city centre.

We have policies on reducing the need to travel however, now we have lots of people working from home. The question to answer is what do you want the city to look like? There are lots of pushes and pulls.

Online shopping could be a significant driver as people want to avoid busy city centres. Less so for the out of town shopping, however, there are out of town food shopping outlets.

'Twenty minutes neighbourhood' is a developing concept where people have access to all amenities they need, however, this is not necessarily developed enough to considered in this exercise.

This information will be used to shape the range of plausible futures scenarios, for example, scenarios with high levels to and from existing retail, or the opposite. These will consider the issues discussed through the scenario narrative within this process.

One consideration is the number of bus services may reduce within Dundee, so the ability to use the bus could be impacted i.e. the bus network. Bus operations may be more important that the fleet upgrade. Buses are still a major contributor of air pollution.

There is a boom in 2nd hand car sales just now and in time more people will be able to buy compliant vehicles. People may switch to the private car in the short term but in the longer term it is uncertain.

We should be cautious of what disruptors we use because the design life of the LEZ is limited. The earlier years of the post-Covid impacts could include a hangover from Covid impacts for example, social distancing/usage on buses.

We should be mindful of the different sectors of the population, specifically more vulnerable people who need to travel and its impact on buses and taxis, for example, considering taxi usage within the disruptors.

We should be ensure that the plausible scenarios include shift in travel, which is plausible within the time horizons we are considering.

Things will not go back to normal after Covid and the future will be different, moving forward.

Post Covid, the public appetite will affect the public in different ways, for example, the business community will be against anything that reduces footfall, however local residents may support LEZ's. The relevance of this as a disruptor is it could be used to describe the narrative which will influence the direction of travel.

Road user charging has featured in the media due to loss in taxation revenue with the uptake in electric vehicles. Is this not a disruptor?.

What are the timescales for this exercise? In 10 years' time an LEZ will not be required. We are trying to consider the impact of uncertainty on the process within the short to medium term e.g. 2-6 years. An outcome will be informing the lifespan of the LEZ.

General agreement that we should capture the uncertainty in fleet changes over the period being considered.

Aberdeen

The city centre could return to pre-Covid conditions, however, there could be reduced traffic and increased pedestrians in in the city centre. This is accompanied with a change in the city centre economy, however, the focus should be on a vibrant and attractive place to visit which is not car dominated.

The City Centre Masterplan (CCMP) may not arrive in time to impact on the LEZ and improve the air quality. Aberdeen is not significantly exceeding air quality levels and it is not clear on the confidence we have on the decision making process.

A concern is the strength of the recovery may not be sufficient to realise the vision of the City Centre Masterplan i.e. less people going into the city centre. The policy interventions as a result may not be as radical as is necessary.

With an LEZ in place, the city centre could provide a calmer environment with quieter traffic. This results in a better place to visit. The CCMP communication could be strengthened to let everyone know that it is coming.

We need to be aware of unintended consequences with online shopping, so the city centre will become more leisure and entertainment based. The change in culture could impact on social inclusion.

There still needs to be accessibility to the city centre and Covid has impacted on public transport, which has been an alternative method of access. The long term impact on PT could impact on PT provision and confidence in public transport.

Cities will adapt in the post-Covid world. Office working will change and as a result footfall and office rents will fall, which results in potential change in use. The fleet composition would impact on the LEZ. Need to make Aberdeen an attractive place to visit for leisure and retail, noting that it has a regional draw.

Nervous of the worst case scenario where traffic levels have return close to pre-Covid levels but this is not reflected in the city centre activity. With increase in online shopping, this could increase delivery trips. If all offices return to normal, what will happen to the trip levels?

The long term vision is clear however there may be some short term pain. For the LEZ to work the supporting infrastructure must be in place to support it e.g. bus lanes, cycling.

Edinburgh

Changes were happening but Covid has accelerated the process. Increase density of office use.

Retail already moving to online but more experiential type offer.

May be a city centre renaissance – keen to get back to enjoy the social activities and cultural life that has been missing. What does the city need to do to reflect that?.

Not a lot, the city was already geared up to cater for large numbers of people.

Place and place management – how do we continue to have a very attractive place for people to be in and how do we continue to manage – a busy animated city centre?.

Children and young families tend to go the Fort / Gyle. It's about having a day out. Retail food, cinema in a good environment, easy to access. City centre is a fantastic arena but Princes St is pretty scruffy really and the public realm is poor. Level of bus activity means that on a warm day, air quality really is an issue.

Better access – tram and active travel promote it as somewhere good to go and a relaxing experience.

Use City Mobility Plan, City Centre Transformation and the LEZ to encourage change. Big chain stores are closing or moving online, there is a need to encourage a broader mix of businesses. Could buildings be specialist stores rather than one big store?.

Piece of work around Princes St – what is the right use of the buildings going forward?.

Christmas markets could be split up more. Tourism is all so concentrated. Use events to draw people to different parts of the city centre.

Create the environment. Deal with busyness of the traffic, dealing with the accessibility, dealing with the air quality, would really underpin the city centre.

Way people travel to city centre may change – public transport to leisure.

A lot investment is going on the city centre – Edinburgh St James, tram and Haymarket which should help support growth.

LEZ is one of the many tools to create the environment that people want to come to the city more attractive.

Edinburgh St James with 1,500 spaces is a concern.

Traffic diversion – where does it go?. Impact on the LEZ boundary. Better planning within the city centre – interface between traffic and PPZ.

Strong policy provision.

Improve the environment, if the shops and attractions aren't there people won't go. The LEZ needs to help create a better environment.

Tourism is important but need to provide a balance with local residents. City centre needs to remain relevant to everyone, young and old.

Night life currently gone but needs to be encouraged to return.

Impact on offices and shops.

Glasgow

Taxi trade has been decimated by Covid, and this may change the landscape of how the city centre will look like. The city centre will recover to a degree as we are creatures of habit. People may look at alternative methods of travel e.g. active travel, and reallocation of road space, and public transport should support this and provide connectivity to get to and from the city centre.

Very uncertain, and beyond the LEZ, reduced vehicle travel in the city centre is needed. The temporary spaces for people measures may become permanent and people will realise that there are alternatives to the private car.

Following Covid, there is likely to be a reduced workforce (and resulting office space) in the city centre with more working from home. This space needs to be reallocated to other uses. The knock-on effect of reduced office space will impact on supporting businesses e.g. food retail. There may be a reduction in cars in the city centre, however, there should be more spaces for the disabled. Promoting car clubs in the city to dissuade owning a car.

There will be a degree of returning to city centre working. There should be reductions in parking in the city centre and the urban villages. More priority should be given to bus provision especially from the urban villages as they provide a service for the vulnerable. Reductions in bus services would have a disproportionate impact on vulnerable people.

The population will not give up their car (ownership) but hopefully for longer journeys. The reallocation of road space (e.g. avenues) will restrict cars but bus service provision is required to maintain the vitality of the city centre.

Covid is accelerating what is everyone is trying to achieve in Glasgow.

A decline in retail post-Covid with an increased social activity in the city centre. We need to keep the city centre vibrant and easy to get to. Reallocation of road space has helped make progress. Need to get people onto public transport.

Following a downturn, there is usually an explosion of activity, for example, the retail centre. The office space will be taken up by others business and finance centres will remain. There will still be residential and the universities will remain. There are more shared surfaces which are not clogging up the network but restricting vehicle movements. Capping the M8 and providing car parking spaces. The city will recover but it will likely be different.

Looking towards a Carbon neutral city by 2030. Retail unit may be replaced by start-up companies and a regeneration of the city will be actioned. Transport Hubs will have a massive part to play and innovated approaches to travel within the city and looking at the last mile deliveries.

There will be a massive reduction in parking spaces in the city centre e.g. spaces for people impacts. There may be more bus gates, electric vehicle and car club parking. There may be an emissions based parking permit scheme to manage demand to the city centre.

Don't want the city centre to back to the way it was. The temporary measures for spaces for people are not attractive, however once they are made permanent they can be made more attractive. The priorities in the future will reflect the travel hierarchy. Difficult decisions ahead for the local authorities. Last mile deliveries and bus service provision are very important. What happens after bus current Covid bus services subsidies are removed? Fearful of the risk to deprived areas and vulnerable people.

Should be asking economic development and retail representatives to get the opinion from other organisations. We have input from economic development in other cities and we are seeing common opinions which apply to Glasgow.

Considering Covid and climate change the LDP want to deliver an increase in residents within the city. These resident need access to transport so a car free city centre is a challenge. Safe and secure parking hubs outside the centre? Retail and office space will continue in the city centre, especially where money is involved. Young people will be desperate to get back into society.

Less traffic, more pedestrianisation and safe route activity within the city. Concerned about more working from home and the effect this will have on the city centre.

Higher priority for walking and cycling with spaces for people and cleaner buses in the future with lower private car use.

4.3 Shortlisting of Input Drivers

4.3.1 Prior to the workshop, a list of 54 possible input drivers, separated into eight themes, were identified by both SYSTRA and Jacobs staff, who are directly involved in the detailed LEZ modelling and appraisal.

4.3.2 This list was circulated to the stakeholders ahead of each workshop, where they were requested to review the list of disruptors and add any they felt were missing, then score each disruptor in terms of likelihood and impact (1-lowest and 10 highest). The purpose of this task was to sift out the most important drivers of uncertainty from the stakeholders' perspectives and present these at the workshop for refinement and confirmation.

4.3.3 It was acknowledged that the period in which the current LEZ would remain applicable is uncertain, but limited, given the continued uptake of compliant vehicles within the vehicle fleet. As such, the disruptors should be considered within a three to ten year time horizon.

4.3.4 During the workshop, the disruptors presented in Table 5 were agreed. Further post-workshop feedback on the disruptors within the workshop has resulted in the following additions to the list of disruptors:

Dundee
- Changes to the function of office space (shared offices / hired office space)

Aberdeen
- Impact on bus patronage (related to social distancing factors)

Edinburgh
- Changing balance between visitors and residents
- Speed of transition to electric cars, taxis and LGVs

Glasgow
- No changes proposed

Table 5. Agreed Disruptors

CITY	DISRUPTORS
Dundee	• Travel demand to/from existing premises – commute (e.g. reduced employment) • Travel demand to/from existing premises – commute (e.g. more home working) • Car travel demand to/from existing premises - shopping (e.g. more on-line and out-of-town shopping) • Impact on proposed bus fleet upgrades (existing fleet conversions) • Bus users switch to private car • Impact on bus patronage (related to social distancing factors) • Public appetite for air quality measures post-Covid?
Aberdeen	• Travel demand to/from existing premises – commute (e.g. more home working) • Travel demand to/from existing premises – commute (e.g. more internet-based) • Car travel demand to/from existing premises - shopping (e.g. more on-line and out-of-town shopping) • Impact on proposed bus fleet upgrades (existing fleet conversions) • Changes to the function of office space (shared offices / hired office space) • Impact on economy
Edinburgh	• Travel demand – change in commuting patterns (e.g. more home working / internet based) • Car travel demand – change in shopping patterns, convenience and comparison goods (e.g. more on-line and out-of-town shopping) • Changing balance between visitors and residents • Impact on proposed bus fleet investment (including fully electric vehicles e.g. Service 30) • Speed of transition to electric cars, taxis and LGVs • Changes to the function of office space (shared offices / hired office space)
Glasgow	• Impact on proposed bus fleet upgrades (existing fleet conversions) • Increase in new purchase of low carbon vehicles • Decrease in purchase of diesel vehicles • Impact on bus patronage (related to social distancing factors) • Changes to the function of office space (shared offices / hired office space) • Shift in policy (further) towards sustainable/healthier modes (walk/cycle) • Delay on committed infrastructure schemes

4.3.5 A full list of the disruptors is presented in **Appendix B** along with the average stakeholder scoring. The highlighted scores indicated the highest ranking disruptors which have been considered.

4.3.6 The feedback received on the disruptors has resulted in the following changes to the list of disruptors. The final list of Drivers are presented in the following tables. This list broadly aligns with the scoring in Appendix B:

Dundee

- Changes to the function of office space (shared offices / hired office space)
- Impact on proposed bus operations
- Changes in fleet composition

Table 6. Final Dundee Disruptors

CITY	DISRUPTORS
Dundee	• Travel demand to/from existing premises – commute • Car travel demand to/from existing premises - shopping • Impact on proposed bus operations • Changes in fleet composition • Impact on bus patronage related to social distancing factors • Public appetite for Air Quality measures post-Covid?

Aberdeen

- Impact on bus patronage (related to social distancing factors)
- Impact on wider economy rather than specifically oil

Table 7. Final Aberdeen Disruptors

CITY	DISRUPTORS
Aberdeen	• Travel demand to/from existing premises – commute • Car travel demand to/from existing premises - shopping • Impact on bus patronage • Impact on proposed bus fleet upgrades • Changes to the function of office space • Impact on wider Aberdeen economy

Edinburgh

Table 8. Final Edinburgh Disruptors

CITY	DISRUPTORS
Edinburgh	• Travel demand to/from existing premises – commute • Car travel demand to/from existing premises - shopping • Changing balance between visitors and residents • Impact on proposed bus fleet investment • Speed of transition to electric cars, taxis and LGVs

Glasgow

- Decrease in new diesel cars not specifically due to Covid but will be maintained.

Table 9. Final Glasgow Disruptors

CITY	DISRUPTORS
Glasgow	• Impact on proposed bus fleet upgrades • Increase in new purchase of low carbon vehicles • Decrease in purchase of diesel vehicles • Impact on bus patronage • Changes to the function of office space • Shift in policy (further) towards sustainable/healthier modes • Delay on committed infrastructure schemes

4.4 Workshop Remarks

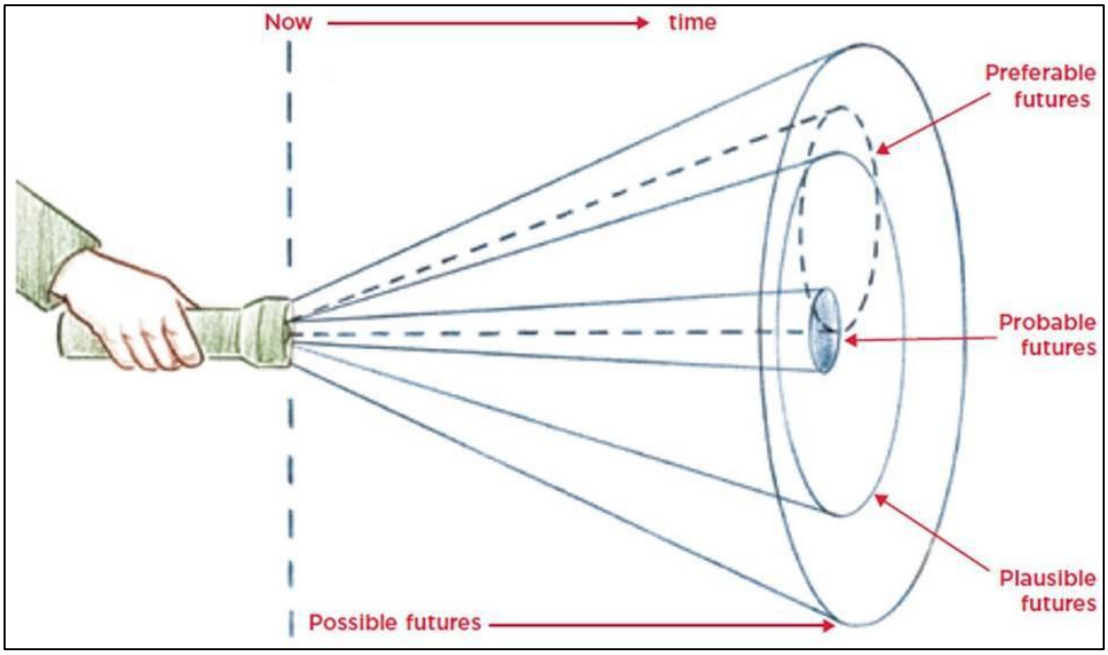
4.4.1 The general view was that the workshops have been valuable in understanding the factors that are important to each city and the different views shared on how Cities may look post-Covid. It is important that contact with each local authority is maintained throughout the process.

5. SCENARIO PLANNING APPROACH

5.1 Scenario Planning Principles

5.1.1 The high level requirement of the Scenario Planning Process and Tool is to provide a means by which the impacts of the LEZ can be gauged within the context of various uncertain plausible futures.

5.1.2 To understand uncertainty within the context of the LEZ, multiple plausible futures were developed with knowledge of the variables and relationships but not necessarily the confidence in the magnitude of the uncertainty. The different types of future that have been considered and where Scenario Planning flourishes is illustrated below[1].



5.1.3 The inputs to the Tool i.e. the make-up of the plausible futures, were defined by the uncertainty drivers defined and agreed by the stakeholders. The Tool functions by using information and known relationships from complex models, such as the traffic and urban air quality models, to predict how well (or otherwise) the outputs of a potential LEZ scheme might align with the LEZ objectives.

5.1.4 It should be recognised that the Process and Tool attempts to use current understanding and relationships to predict answers to qualitative, future-facing questions. There are different possible approaches that could influence how a Scenario Planning Process and Tool is developed and this is discussed further in the process adopted for the Nation Transport Strategy[2].

5.1.5 The work undertaken to date on the LEZ schemes point towards a *'preferred future'*. Scenario Planning can allow for the identification of those *probable*, *plausible* or *possible futures* which overlap with the *'preferred future'*.

[1] Image reproduced from https://media.nesta.org.uk/documents/dont_stop_thinking_about_tomorrow.pdf

[2] https://www.transport.gov.scot/publication/scenario-planning-process-report/

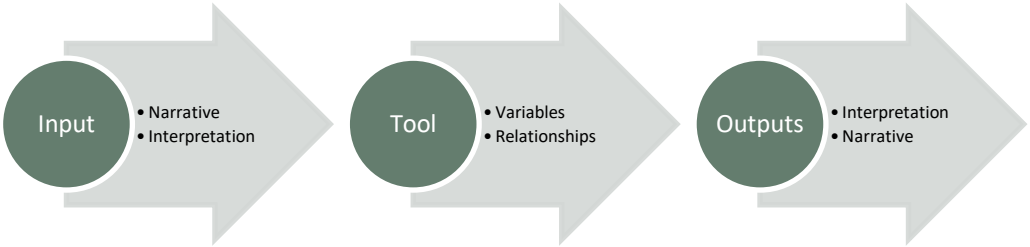
5.2 Scenario Planning Process and Tool

5.2.1 The Scenario Planning Process allows a range of plausible future scenarios to be defined using various important and likely disruptors. Each scenario is defined using a range of inputs (whether quantitative or qualitative) derived from an input narrative which are applied to the Scenario Planning Tool. The Scenario Planning Tool is a simple spreadsheet model that links the inputs and metrics using known relationships. Outputs for each scenario are generated by the tool and these are integrated into the scenario narrative. These scenarios, or a subset of, are used as a reference case where a scheme or in this case, the LEZ, is applied to understand how it performs in the context of each scenario.

5.2.2 The impact of the LEZ is quantified by understanding and predicting the impact (again, quantitative or qualitative) it will have on each scenario. The Scenario Planning Tool quantifies the impact of the LEZ scheme and the metrics from the Scenario Planning Tool are then translated back into an output narrative to complement the input narrative.

5.2.3 The process, illustrated below provides an opportunity to think through:

- Who will be impacted on by the LEZ and how will they be affected;
- Which of the outcomes will the LEZ support
- Whether the LEZ likely presents any tensions/negative impacts on the outcomes.



5.2.4 The process includes an opportunity to document any evidence to support the conclusion that the LEZ will have an impact on the agreed outcomes in the manner intended or if any further detailed modelling is required.

5.2.5 The Scenario Planning Tool is designed to complement the work undertaken to date and understand if any further modelling of the LEZ schemes is required to consider uncertainty.

6. PLAUSIBLE FUTURES TESTING

6.1 Disruptors

6.1.1 A review of the disruptors for each city combined with the discussions surrounding them within the workshops confirmed that whilst there were subtle differences between the cities the themes were common. With this in mind, a generic list of disruptors was defined (A to L) which are seen as suitably representative to be used for all the cities. This is presented in Table 10.

Table 10. Generic Disruptors

Derived Disruptors (Dundee)	Derived Disruptors (Aberdeen)	Derived Disruptors (Glasgow)	Derived Disruptors (Edinburgh)	Final Generic Disruptors	
Travel demand to/from existing premises – commute	Travel demand to/from existing premises – commute		Travel demand – change in commuting patterns (e.g. more home working / internet based)	**Travel demand to/from existing premises – commute**	**A**
Car travel demand to/from existing premises - shopping	Car travel demand to/from existing premises - shopping		Car travel demand – change in shopping patterns, convenience and comparison goods (e.g. more on-line and out-of-town shopping)	**Travel demand to/from existing premises - shopping**	**B**
Impact on proposed bus operations				**Impact on proposed bus operations**	**C**
Changes in fleet composition	Impact on proposed bus fleet upgrades	Impact on proposed bus fleet upgrades	Speed of transition to electric cars, taxis and LGVs	**Changes in fleet composition**	**D**
		Increase in new purchase of low carbon vehicles	Impact on proposed bus fleet upgrades		**E**
		Decrease in purchase of diesel vehicles			**F**
Impact on bus patronage related to social distancing factors	Impact on bus patronage	Impact on bus patronage		**Impact on bus patronage**	**G**
Public appetite for Air Quality measures post-Covid?				**Public appetite for Air Quality measures post-Covid?**	**H**
	Changes to the function of office space	Changes to the function of office space	Changes to the function of office space (shared offices / hired office space)	**Changes to the function of office space**	**I**
	Impact on wider Aberdeen economy		Changing balance between visitors and residents	**Impact on wider economy**	**J**
		Shift in policy (further) towards sustainable/healthier modes		**Shift in policy (further) towards sustainable/healthier modes**	**K**
		Delay on committed infrastructure schemes		**Delay on committed infrastructure schemes**	**L**

6.2 Output Metrics

6.2.1 The output metrics are used to understand the performance of the city centre in each of the plausible future scenarios with consideration of the LEZ objectives. The two broad categories are: emissions and vehicular traffic, which represents the indicators for the LEZ objectives for each city; Aberdeen, Dundee, Edinburgh and Glasgow, presented in Table 1.

6.3 Scenario Planning Tool

6.3.1 An important aspect of the tool is that there is a level of judgment when populating inputs and interpreting the outputs. The tool is designed to inform the likely LEZ outcomes, not precisely measure the impact of an LEZ. The tool has been tested in advance of active use to ensure it is producing intuitive results which are credible, coherent and comprehensible. Examples are discussed in Section 5.5.3.

6.3.2 As discussed previously, the structure of the tool comprises three core elements:

- Inputs;
- Impacts; and
- Metrics.

6.3.3 Again, the application of the tool uses these elements to form a more comprehensive structure:

- Plausible Future Inputs;
- Plausible Future Assessment;
- LEZ Inputs; and
- LEZ Future Assessment.

6.4 Plausible Scenarios

6.4.1 The most likely disruptors (A to L in Table 10) which will have the biggest impact, are individually scored using a 7 point scale (from -3 to 3) to understand any change will have on emissions and travel demand .

6.4.2 The next stage is to consider the relationships between each disruptors, e.g. what disruptors are linked with other disruptors? For example, changes to travel demand for commuting could be linked with changes to bus operations and travel demand for shopping, amongst others. Table 11 details the proposed relationships (1 denotes a relationship, 0 denotes no plausible relationship) identified between the disruptors which have been used to derived the plausible future scenarios.

6.4.3 An example of the relationships between the disruptors being used to derive plausible scenarios is starting with Disruptor A. Table 11 confirms that A could be linked with B, B is linked with C, C is linked with H. This linkage creates a plausible scenario, with a narrative: *Increased travel demand (commuting) resulting in increased travel demand (shopping), improved bus operations and more buoyant economy.* Different plausible scenarios can be developed from each disruptor or 'Driver' (Driver being the initial disruptor that drives the scenario).

Affector	Affected →	A	B	C	D	E	F	G	H	I	J
↓ Variant	Disruptor Relationship 0 = No, 1 = Yes	Increased Travel demand to/from existing premises – commute	Increased Travel demand to/from existing premises - shopping	Reduced proposed bus operations	Improved in fleet composition/compliance level	Impact of social distancing on bus patronage	Improved Public appetite for Air Quality measures post-Covid?	Changes to the function of office space e.g. Reduced office space tranferred to residential/Retail	Boyant wider economy	Further Shift in policy towards sustainable/healthier modes	Delay on committed infrastructure schemes
A	Increased Travel demand to/from existing premises – commute	0	1	1	0	0	1	1	0	0	0
B	Increased Travel demand to/from existing premises - shopping	1	0	1	0	0	1	0	0	0	0
C	Reduced proposed bus operations	1	1	0	1	0	0	0	1	1	0
D	Improved in fleet composition/compliance level	0	0	0	0	0	1	0	0	1	0
E	Impact of social distancing on bus patronage	1	1	1	0	0	0	1	1	0	0
F	Improved Public appetite for Air Quality measures post-Covid?	0	0	0	0	0	0	0	0	1	1
G	Changes to the function of office space e.g. Reduced office space tranferred to residential/Retail	1	1	1	0	0	1	0	0	1	1
H	Boyant wider economy	1	1	1	1	0	0	0	0	0	1
I	Further Shift in policy towards sustainable/healthier modes	0	0	1	1	0	1	0	0	0	1
J	Delay on committed infrastructure schemes	0	0	0	0	0	1	0	0	1	0

Table 11. Disruptor Relationships

6.4.4 A total of 40 plausible future scenarios were created (10 Drivers with 4 variations in direction) with a short descriptive narrative and a corresponding set of input parameter values for each. Each plausible future was fed into the Scenario Planning Tool to confirm the logical nature of their metrics.

6.4.5 For example, for Driver A being the primary influence, the 4 scenario variants were:

- **A1**: 'Optimistic Outcome' –
  A buoyant economy increases travel demand (commuting) resulting in increased travel demand (shopping), improved bus operations and continued investment in network infrastructure improvements
- **A2**: 'Realistic Downturn' –
  Following an economic downturn, decreased travel demand (commuting) resulting in decreased travel demand (shopping), results in reduced bus operations
- **A3**: 'Placemaking Outcome'-
  Post-Covid, decreased travel demand (commuting) results in reduced office space. This change in city centre function from office to retail / residential helps placemaking in the city centre area. From this, the public appetite for air quality measures becomes more important, which may lead to further shift in policy for sustainable transport and fast-tracking of sustainable transport schemes
- **A4**: 'Alternative Impact of Increase in Commuting'
  Increased travel demand (commuting) resulting in normal or increased function of office space (not working at home as much as during COVID). Bus demand (& operations) would be retained with non- compliant buses remaining on the network, resulting in poorer air quality out-with core city centre area. This may force Local Authories/Government to shift policy further to more healthier modes / improve fleet

6.4.6 The scenario planning tool calculates a score for each scenario, using the 7 point scale score (-3 to 3) for each disruptor.

6.4.7 Using the above example Scenario A1, the cumulative impact score was calculated as detailed in Table 12. Note the polarity application (or direction of travel) to the score for each disruptor. The resulta score for scenario A1 was 12 for emissions and 17 for traffic volumes, with a combined total of 29.

6.4.8 Each scenario Driver with four plausible future is illustrated in Table 13 along with the respective scoring for emissions and travel volumes.

Table 12. Example of Scenario Scoring (Scenario A1)

Polarity		Scenarios	NOX emissions in the LEZ area:	Carbon	Active Travel	Cars	Taxis	LGVs	HGVs	Buses
1	1	Increased Travel demand to/from existing premises – commute	3	1	1	2	1	0	0	0
1	2	Increased Travel demand to/from existing premises - shopping	3	1	1	2	1	0	0	0
-1	3	Reduced proposed bus operations	-2	-1	1	1	1	0	0	-2
1	8	Boyant wider economy	2	1	1	2	1	2	2	1
-1	10	Delay on committed infrastructure schemes	1	1	-2	1	1	0	0	-1
		Sum	**9**	**3**	**4**	**4**	**1**	**2**	**2**	**4**
		Emissions Total		**12**						
		Travel Volumes								**17**

Table 13. Extended List of Plausible Futures

SCENARIO			CUMULATIVE IMPACT		
Scenario Driver	Scenario Detail	Scenario Variant	Emissions	Travel Volumes	TOTAL
A	Increased Travel demand to/from existing premises – commute	A1	12	17	29
		A2	-12	-17	-29
		A3	-12	-1	-13
		A4	9	2	11
B	Increased Travel demand to/from existing premises - shopping	B1	6	13	19
		B2	-7	2	-5
		B3	-12	-16	-28
		B4	-2	5	3
C	Reduced proposed bus operations	C1	-9	2	-7
		C2	1	5	6
		C3	-11	-1	-12
		C4	0	15	15
D	Improved in fleet composition/compliance level	D1	-8	2	-6
		D2	-7	-3	-10
		D3	2	-2	0
		D4	-2	-8	-10
E	Impact of social distancing on bus patronage	E1	3	6	9
		E2	1	-3	-2
		E3	1	8	9
		E4	-11	0	-11
F	Improved Public appetite for Air Quality measures post-Covid?	F1	-6	1	-5
		F2	6	-1	5
		F3	-5	3	-2
		F4	-7	-3	-10
G	Changes to the function of office space e.g. Reduced office space tranferred to residential/Retail	G1	-11	-8	-19
		G2	1	0	1
		G3	-5	1	-4
		G4	3	4	7
H	Boyant wider economy	H1	-3	11	8
		H2	2	9	11
		H3	9	18	27
		H4	3	-11	-8
I	Further Shift in policy towards sustainable/healthier modes	I1	-8	2	-6
		I2	-7	-9	-16
		I3	-6	2	-4
		I4	6	-2	4
J	Delay on committed infrastructure schemes	J1	6	-2	4
		J2	-4	0	-4
		J3	-7	-8	-15
		J4	-8	2	-6

6.4.9 Any With-LEZ scenario can then be compared with its corresponding without-LEZ plausible future, to understand the predicted its impact.

6.4.10 In order to sift the above list of plausible scenarios into a more concise set of scenarios which encompass the range of emissions and travel relationships, Figure 1 illustrates the criteria for selection (one scenario for each quadrant).

Emissions	Trips
+	+
+	-
-	+
-	-

Figure 1. Scenario Sifting Criteria

6.4.11 Four short listed scenarios were identified to reflect the different viewpoint in terms of both emissions and trip making i.e. one scenario from each quadrant, (illustrated in Figure 2). The specific scenario selected does not necessarily have to be the worst case in each quadrant, only the direction of travel is important at this stage e.g. low emissions and reduced trips.

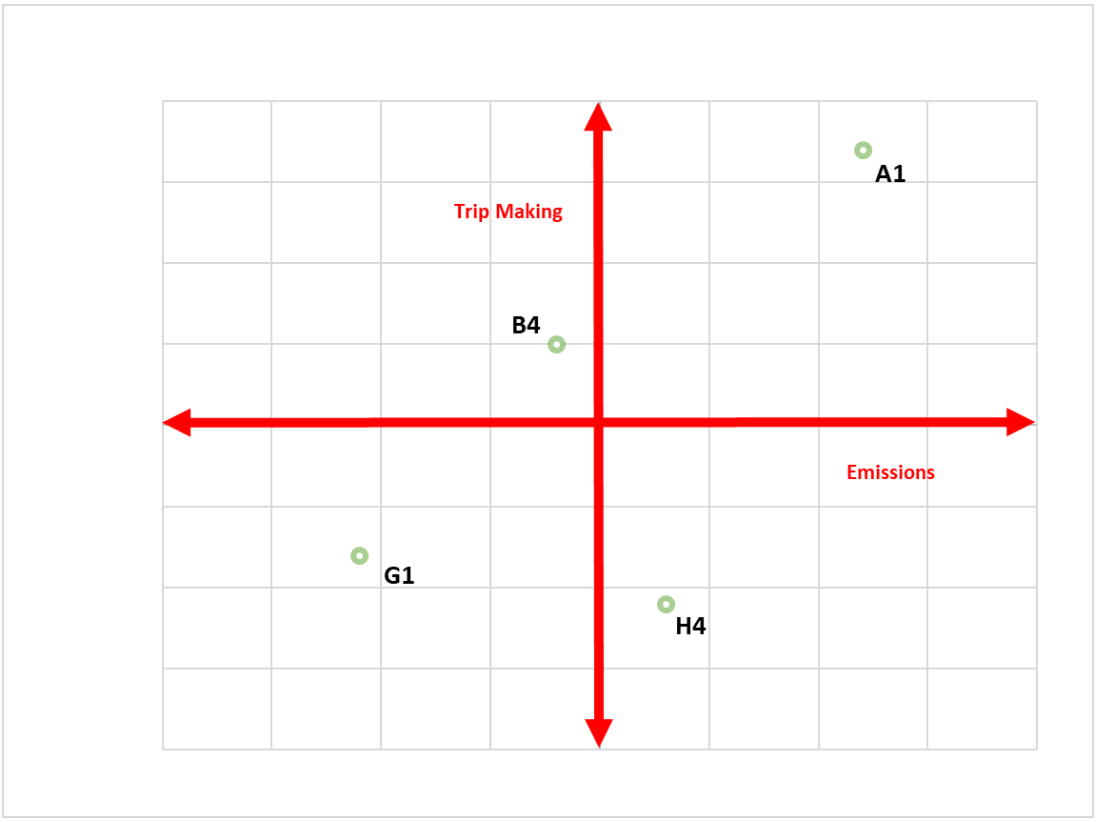


Figure 2. Four Short-listed Futures

6.4.12 The scenario names detailed in Figure 2 correspond with the variants listed in Table 13.

6.4.13 Each scenario provides an insight into what a future could look like in terms of differing outcomes. The narrative which defines the four plausible futures therefore were:

- A1: 'Bounce Back' - Increased commuting and retail travel demand, improved bus operations and more buoyant economy along with a suppressed enthusiasm for compliant vehicles.

- H4: 'Coping as Best We Can' - A poorly performing economy results in delayed infrastructure investment, a lack of shift to healthier modes and fleet, and a lack of appetite for additional air quality measures
- G1: 'Brave New World' - Following Covid there has been a reduction in office space which has transferred to other uses. With this a general reduction in traffic in the city centre for both commuting and shopping, however the uptake in compliant vehicles continues.
- B4: 'It Could Have Been Worse' - Increased retail travel demand resulting in increased congestion however public appetite for further Air Quality measures, which supports further policy shift towards more sustainable measures including a zero-Carbon fleet.

6.4.14 Each of the four pre-defined plausible futures have been run through the tool in preparation for testing the LEZ. The performance of each scenario against transport policy has been illustrated in RBG in Figure 3 and Table 14 as follows:

- Red – Negative effect (Score <-1)
- Blue – Neutral i.e. little change (Score of -1 to 1)
- Green – Positive effect (Score >1)

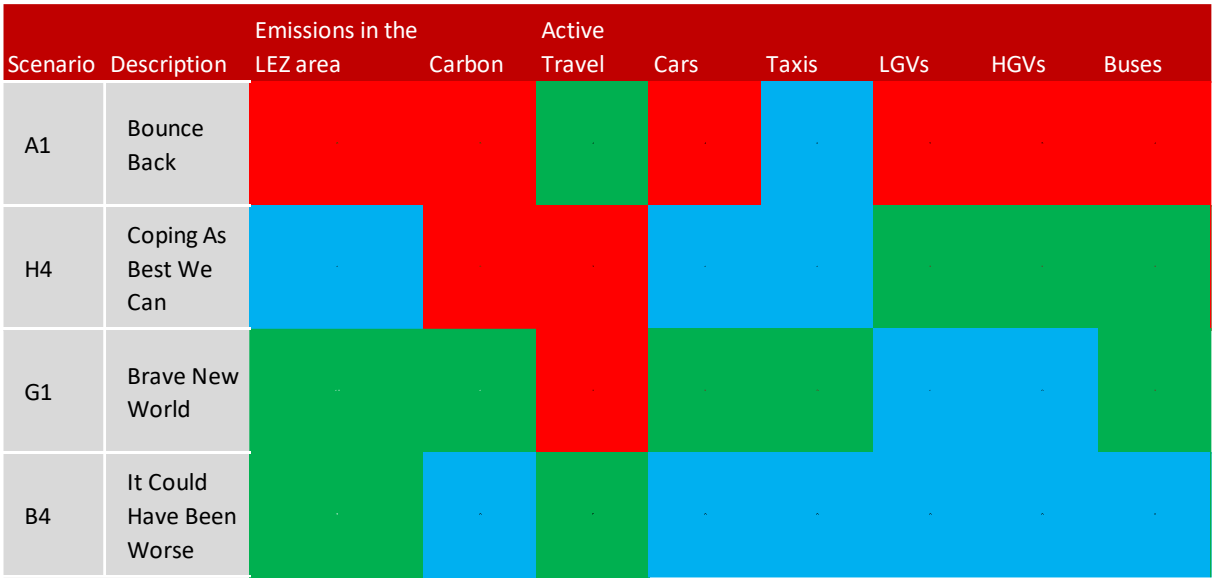


Figure 3. RBG Plausible Without-LEZ Scenarios

Table 14. Plausible Without-LEZ Scoring

Scenario	NOX emissions in the LEZ area:	Carbon	Active Travel	Cars	Taxis	LGVs	HGVs	Buses
A1	9	3	4	4	1	2	2	4
H4	1	2	-7	1	1	-2	-2	-2
G1	-10	-1	-3	-2	-2	1	0	-2
B4	-2	0	5	0	0	0	0	0

6.5 Testing of LEZ on Different Futures

6.5.1 Following the definition of the without-scheme scenarios, the LEZ scheme will be tested against each scenario. The LEZ Scenario is assumed to deliver the following benefits to the city centres however it is recognised that the impact will vary depending on each scenario:

- Reduction in Emissions
- Increase in Active Travel
- Reduction in car trips
- No change to LGVs, HGVs and Buses (assumed to be compliant)

6.5.2 It is recognised that the LEZ proposals have specific legislation with respect to compliant and non-compliant vehicles. This results in the impact of an LEZ varying depending on each specific scenario.

6.5.3 Table 15 summarises the weighted scoring applied to each of the four scenarios, as a result of the LEZ scheme.

Table 15. Impact of LEZ on Scenario Scoring

Scenario	NOX emissions in the LEZ area:	Carbon	Active Travel	Cars	Taxis	LGVs	HGVs	Buses
A1	-9	2	2	-6	-3	-2	-2	0
H4	-2	1	1	-2	-1	0	0	0
G1	-1	0	0	-1	0	-1	-1	0
B4	-1	0	0	-1	0	-1	-1	0

6.5.4 Table 15 shows, for example, that the LEZ will have a significant impact on NOX emissions in scenario A1 (increased travel demand and emissions) but less so in the other scenarios (where trips or emissions are reduced).

6.5.5 The outcome of this testing of the LEZ, results in impacts against emissions and vehicles as illustrated in Figure 4 and Table 16.

Scenario	Description	Emissions in the LEZ area	Carbon	Active Travel	Cars	Taxis	LGVs	HGVs
A1	Bounce Back							
H4	Coping As Best We Can							
G1	Brave New World							
B4	It Could Have Been Worse							

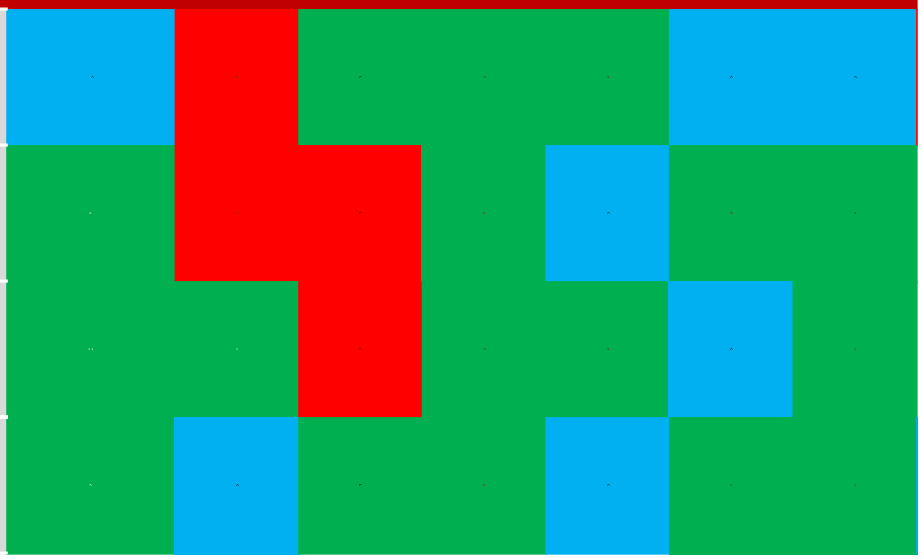


Figure 4. RGB Plausible With-LEZ Futures

Table 16. Plausible With-LEZ Scoring

Scenario	NOX emissions in the LEZ area:	Carbon	Active Travel	Cars	Taxis	LGVs	HGVs	Buses
A1	0	5	6	-2	-2	0	0	4
H4	-1	3	-6	-1	0	-2	-2	-2
G1	-11	-1	-3	-3	-2	0	-1	-2
B4	-3	0	5	-1	0	-1	-1	0

6.5.6 The narrative of the outcome of testing the LEZ against each future is summarised below.

- Scenario A1 'Bounce Back': With the introduction of the LEZ the volume of non-compliant vehicles have reduced which has demonstrated a marked improvement in the NOX levels within the city centre however, traffic will re-route around the city centre. The volume of vehicles within the LEZ area has reduced and active travel has increased as a result.
- Scenario H4 'Coping as Best We Can': The LEZ has reduced the emissions within the LEZ area to an acceptable level however there is still re-routeing vehicles. The reduction in vehicular traffic has reduced below current levels however limited active travel increases have been achieved.
- Scenario G1 'Brave New World' & B4 'It Could Have Been Worse': The emission levels are still at acceptable levels with little change as a result of the LEZ scheme.

6.5.7 Whilst the LEZ may achieve a consistent goal in terms of NOX emissions, it is important to understand that the consequences of a LEZ may vary e.g. re-distribution of traffic effects.

7. CONCLUSIONS & RECOMMENDATIONS

7.1 Conclusions

7.1.1 This note sets out the consideration of uncertainty to assist decision makers. Through stakeholder engagement, the most likely disruptors that will have the highest impact have been identified and used to shape plausible futures. In addition, the key metrics have been set out to measure the impact of the LEZ against the objectives.

7.1.2 A scenario planning tool has been developed and has explored the scenarios which have resulted in an increase/decrease in emissions and trip making. These scenarios have been used to understand the impact of an LEZ scheme.

7.1.3 This process demonstrates that the impact of the Low Emission Zones will vary between each city depending on their specific traffic levels and fleet composition. But importantly, the LEZ will protect the city centres by preventing non-compliant vehicles from entering them.

7.1.4 Whilst the impact of the LEZ may vary across each city in terms of NOX emissions, the outcome is likely to be very similar with the level of emissions limited to a reduced value compared to pre-LEZ levels. It is acknowledged that the LEZ will have greater impact in specific future scenarios compared to others, examples of which are discussed below:

- With high levels of compliance and reduced traffic levels, the LEZ may have a limited effect however the LEZ protects the desired outcome with a reduced level of emissions in the city centres. The LEZ does also maintain the momentum of applying legislation to protect the environment.
- With lower uptake of compliant vehicles, the LEZ provides the mechanism to secure the reduced emissions levels in the future and protect the city centre environment; however, there may be consequences of vehicle re-routeing.
- With higher traffic levels and the likely increase in volumes of non-compliant vehicles, the LEZ manages the number of non-compliant vehicles entering the city centres, however again there may be consequences of vehicle re-routeing as would be expected of a scheme that prohibits access for non-compliant vehicles.

7.1.5 It is acknowledged that where significant traffic re-routing may occur as a result of the LEZ scheme, there may be an increase in the local Carbon footprint. However, this marginal negative consequence of the LEZ proposals should be viewed in the context of the more significant benefits of the scheme for the local air quality.

7.1.6 A significant amount of work has been undertaken to date developing models and using one future scenario. The role of the LEZ is clear, as is the understanding of what it may achieve for a city centre, however each future scenario will have varying consequences as a result of the LEZ. To that end, it is suggested that each city should consider modelling alternative scenarios and Section 6.2 sets out potential sensitivity test scenarios that could be considered by each of the four cities.

7.1.7 The LEZ objectives across all four cities includes references not only to emissions but other supporting strategies which promote reducing traffic levels, active/sustainable travel, and improving the city centre as a place to visit. This was a consistent theme discussed throughout the consultation workshops and is consider very important when considering uncertainty over what city centres will look like post-Covid. This reiterates the hypothesis that the LEZ should

not be considered in isolation, but is part of an overall strategy to meet the national, regional and local visions for the city centres.

7.2 Recommendations

7.2.1 For each of the four LEZ cities, the four identified plausible futures (with varying traffic demand and vehicle compliance levels) have been considered against the model assessments undertaken to date. From this, to address uncertainty, recommendations for further sensitivity testing of the proposed LEZ schemes, under alternative future scenarios, are provided.

7.2.2 It should be noted that the future network which the primary LEZ model testing has been undertaken ('core testing') varies between each city. For example, Aberdeen LEZ testing has assumed growth to 2024, whereas Dundee and Edinburgh model testing has assumed a baseline network demand level for the scheme assessment.

7.2.3 These different compliance and growth assumptions for each city are each valid and robust approaches to the assessment of the LEZ schemes. What is critical, is that each city considers the potential impact of the alternative future scenarios within their assessment.

7.2.4 It should also be noted that there are significant differences in the traffic network conditions within each city which have defined the testing strategies to date, and will also define what alternative plausible future scenarios are considered for sensitivity testing. These include:

- Glasgow and Edinburgh LEZ areas include demand management measures to restrict traffic growth (e.g. car parking strategies). Aberdeen and Dundee LEZ areas have capacity to accommodate traffic and economic growth.
- Dundee and Glasgow LEZ assessments are primarily concerned with the impact of displaced traffic from originating and destinating within the LEZ area. Edinburgh and Aberdeen LEZ assessments include the impact of through routing traffic relocation
- Dundee LEZ does not need to consider the parallel impact of other proposed infrastructure measures. Glasgow LEZ needs to consider measures which conflict with the impact of the LEZ, whilst Aberdeen LEZ needs to consider complimentary measures.
- Each city has subtly varying objectives for the LEZ, including the requirement to specifically achieve the air quality compliance levels or more generally to reduce emissions.

7.2.5 Tables 17 to 20 outlines the consideration of scenario planning to each of the four cities in turn. Each city list four scenarios which have been derived through this process. The scenarios listed (See 5.4.7) should be modelled using the following guide:

1. Scenario B4 'It Could Have Been Worse': The fleet projections follow pre-Covid trends provided by SEPA and the traffic growth is in line with current Local Development Plan Allocations/uptake.
2. Scenario H4 'Coping as Best We Can': Following an economic downturn, the fleet projections are lower than pre-Covid trends provided by SEPA and traffic shrinkage is experienced, similar to the 2010 downturn. Where appropriate, reduce bus demand should be accounted for as a sensitivity test, as set out in section 6.2.7.

3. Scenario G1 'Brave New World': The fleet projections follow pre-Covid trends provided by SEPA however behavioural change results in traffic levels remaining consistent with pre-Covid levels.
4. Scenario A1 'Bounce Back': The fleet projections are lower than pre-Covid trends provided by SEPA and the traffic growth continues due to Increased commuting and retail travel demand, similar to Scenario B4.

Table 17. Scenario Planning Application to Aberdeen LEZ

Scenario Planning Scenarios			Scenario Detail		Traffic Modelling		
No.	Emmissions	Trips	Fleet Compliance	Traffic Flow	Core Testing	Sensitivity Testing	Rationale
1	-	+	High Level uptake	High Growth	✓		This is the 2024 Ref Case scenario from which the initial 8 LEZ scenarios are to be assessed
2	+	-	Low Level uptake	Network Shrinkage		✓	Supporting evidence
3	-	-	High Level uptake	Low Growth		✓	Supporting evidence
4	+	+	Low Level uptake	High Growth		x	Scenario 1 suggests network capacity issues so any additional traffic demand from a lower compliance level would restrict availability for growth. Therefore, Scenario 4 is not plausible for Aberdeen

Table 18. Scenario Planning Application to Dundee LEZ

Scenario Planning Scenarios			Scenario Detail		Traffic Modelling		
No.	Emmissions	Trips	Fleet Compliance	Traffic Flow	Core Testing	Sensitivity Testing	Rationale
1	-	+	High Level uptake	High Growth		x	Scenario 4 is the worst case scenario for Dundee in terms of traffic displacement from the city centre
2	+	-	Low Level uptake	Network Shrinkage		✓	Consideration of a shriking economy and the potential lower benefits of a LEZ
3	-	-	High Level uptake	Low Growth		x	This is an intermediate scenario that would not provide any more information to Scenario 4
4	+	+	Low Level uptake	High Growth	✓		This is the future year scenario that the proposed LEZ options have been tested on to date

Table 19. Scenario Planning Application to Glasgow LEZ

Scenario Planning Scenarios			Scenario Detail		Traffic Modelling		
No.	Emmissions	Trips	Fleet Compliance	Traffic Flow	Core Testing	Sensitivity Testing	Rationale
1	-	+	High Level uptake	Pre-COVID Levels	✓		Testing undertaken to date includes traffic growth with a variation in low and high levels of fleet uptake
2	+	-	Low Level uptake	Network Shrinkage		✓	Demand management in Glasgow (via car parking strategies) are likely to restrict growth so lower growth sensitivity testing deemed a plausible scenario
3	-	-	High Level uptake	Low Growth		✓	As per Option 2
4	+	+	Low Level uptake	Pre-COVID Levels	✓		As per Option 1

Table 20. Scenario Planning application to Edinburgh LEZ

Scenario Planning Scenarios			Scenario Detail		Traffic Modelling		
No.	Emmissions	Trips	Fleet Compliance	Traffic Flow	Core Testing	Sensitivity Testing	Rationale
1	-	+	High Level uptake	Pre-COVID Levels		x	Not required, as demand management (via car parking strategies) should restrict increased traffic growth
2	+	-	Low Level uptake	Network Shrinkage	✓		As per Option 3 but zero growth tested as opposed to traffic network shrinkage
3	-	-	High Level uptake	Low Growth	✓		Testing undertaken to date includes no growth with a variation in low and high levels of fleet uptake
4	+	+	Low Level uptake	Pre-COVID Levels		x	As per Option 1

7.2.6 As detailed in the above tables, there are suggested alternative future scenarios to be considered by each local authority for potential sensitivity testing of their proposed LEZ measures.

7.2.7 In addition to the above, a further future scenario (within Scenario 2, with a poorly performing economy) with a potential reduction in public transport service provision. Traffic services may reduce due to a lower patronage resulting from COVID-19 however the magnitude of this may vary by city depending on the local conditions. There is applicable functionality within the public transport element of SEPA's National Framework Air Quality Model. This feature can assess the potential impact to emission levels if the volume of public transport within the LEZ area is reduced from pre-COVID levels. It is proposed that this is the most suitable tool and should be used instead of detailed traffic modelling.

7.2.8 In terms of a timeline, these sensitivity tests are proposed to be consistent with the core testing background scenario year (2022-2024). It is recognised that the LEZ adherence criteria will only provide impact to the network for a finite period of time. The consideration of scenario planning is not therefore to consider how the network will change in the longer term, but to consider the potential plausible futures over the short (Post-COVID) to medium term.

7.2.9 The objectives of undertaking the proposed sensitivity tests are to provide evidence that the LEZ schemes are robust to variations in network conditions that may occur in a post-pandemic world. Each city may undertake different sensitivity scenarios, but they will have all considered plausible futures under a consistent framework.

APPENDIX A

A.1 Dundee Workshop Attendees

NAME	ORGANISATION
Malcolm Neil	SYSTRA
Grant Davidson	Jacobs
Boris Johansson	SYSTRA
Keith Gowenlock	Jacobs
Christopher Shaw	SYSTRA
Ewan Gourlay	Dundee City Council
Iain Black	Dundee City Council
Tom Stirling	Dundee City Council
John Berry	Dundee City Council
David Gray	Dundee City Council
Jamie Landwehr	Dundee City Council
Vincent McInally	Transport Scotland
Stephen Cragg	Transport Scotland
Colin Gillespie	SEPA
Nicola Ferguson	Dundee City Council
Niall Gardiner	Tactran

A.2 Aberdeen Workshop Attendees

NAME	ORGANISATION
Malcolm Neil	SYSTRA
William Hekelaar	Aberdeen City Council
Boris Johansson	SYSTRA
Grant Davidson	Jacobs
Keith Gowenlock	Jacobs
Callum Guild	SYSTRA
Tony Maric	Aberdeen City Council
Gale Beattie	Aberdeen City Council
Vincent McInally	Transport Scotland
Colin Gillespie	SEPA
Joanna Murray	Aberdeen City Council
Aileen Brodie	Aberdeen City Council
Paul Finch	Nestrans
Tom Walsh	Aberdeen City Council
Jenny Anderson	Nestrans
Richard Sweetnam	Aberdeen City Council
David Dunne	Aberdeen City Council

A.3 Edinburgh Workshop Attendees

NAME	ORGANISATION
Grant Davidson	Jacobs
Keith Gowenlock	Jacobs
Vincent McInally	Transport Scotland
Alan McDonald	SEPA
Boris Johansson	SYSTRA
Ewan Kennedy	City of Edinburgh Council
Iain McFarlane	City of Edinburgh Council
David Cooper	City of Edinburgh Council
Gavin Brown	City of Edinburgh Council
Will Garrett	City of Edinburgh Council
Shauna Clarke	City of Edinburgh Council
Andrew Smith	City of Edinburgh Council
Jim Stewart	SEStran

A.4 Glasgow Workshop Attendees

NAME	ORGANISATION
Malcolm Neil	SYSTRA
Dom Callaghan	Glasgow City Council
Grant Davidson	Jacobs
Keith Gowenlock	Jacobs
Boris Johansson	SYSTRA
Vincent McInally	Transport Scotland
Julie Robertson	Glasgow City Council
Mic Ralph	Glasgow City Council
Andy MacGibbon	Glasgow City Council
Collin Little	Glasgow City Council
Donald Booth	SPT
Julie Evans	Glasgow City Council
Graeme Dewar	Glasgow City Council
Lewis Douglas	Glasgow City Council
John Sharkey	Glasgow City Council
Andrew Malby	SEPA
Emil Laiolo	Glasgow City Council
Eric Stewart	Glasgow City Council
Chris Shaw	SYSTRA
Gillian Dick	Glasgow City Council
Derek Barry	Glasgow City Council
Paul Morris	Glasgow City Council

APPENDIX B

B.1 Dundee Disruptors

Travel Demand	Score Pre-Consultation	Score Post-Consultation
CAR		
● Travel demand to/from existing premises – commute (e.g. reduced employment)	52	48
● Travel demand to/from existing premises – commute (e.g. more home working)	62	57
● Travel demand to/from existing premises – business travel (e.g. economic downturn)	42	40
● Travel demand to/from existing premises – business travel (e.g. more internet-based)	48	46
● Travel demand to/from existing city-centre premises - shopping (e.g. economic downturn)	44	44
● Car travel demand to/from existing premises - shopping (e.g. more on-line and out-of-town shopping)	51	48
● Travel demand to/from existing premises - other leisure (e.g. economic down-turn and reduced city centre businesses)	38	30
LGV		
● Increase in volume of LGV on network as a result of increase in on-line shopping	44	43
● Reduction in volume of LGV on network as a result of economic downturn	24	26
HGV		
● Reduction in volume of HGV on network as a result of economic downturn	22	25
Taxi		
● Change in taxi demand due to reduction in bus/rail demand	27	24
● Change in taxi demand due to reduction in leisure trips	28	26
● Change in taxi demand due to reduction in business trips	33	32
● Changes to type of new car due to trip purpose changes	16	18

Fleet Composition	Score Pre-Consultation	Score Post-Consultation
PT		
● Impact on rail patronage (related to services and fares)	22	33
● Impact on proposed bus fleet upgrades (existing fleet conversions)	62	55
CAR		
● Increase in New Purchase of Low Carbon Vehicles	33	34
● Decrease in New Purchase of Diesel Vehicles	42	45
● Change in the overall number of people buying new cars	50	36
LGV		
● Increase in EURO 6 new vehicle purchases	25	31
● Change in the overall number of people buying new LGV	37	32
HGV		
● Increase in EURO 6 new vehicle purchases	21	27
● Change in the overall number of people buying new HGV	31	29
● Reduction in volume of HGV on network as a result of economic downturn	25	25

Behavioural Response	Score Pre-Consultation	Score Post-Consultation
Walk / Cycle		
● Proportion of people who have changed mode to walk / cycle during COVID period	35	37
● Proportion of people who are walking / cycling now, who will continue to do so, post-covid	18	20
PT		
● Bus users switch to private car	60	54
● Impact on bus patronage (related to social distancing factors)	52	56
● Impact on bus patronage (related to services and fares)	41	45
Rail		
● Rail passengers switch to private car	42	42
● Impact on rail patronage (related to social distancing factors)	28	40
Car		
● Car occupancy levels reduce as people travel in separate cars	42	41
● Car occupancy levels increase as car share increases due to switch from bus / rail	31	36
Taxi		
● Bus and rail passengers switch to Taxi e.g. vulnerable members of the public	20	15

LEZ Concept	Score Pre-Consultation	Score Post-Consultation
● Public appetite for Air Quality measures post covid?	53	42
● Public acceptance post-implementation?	34	35

Travel pattern	Score Pre-Consultation	Score Post-Consultation
Potential changes to Parking Policy	42	45
Changes to LGV trips across the whole network (residential deliveries)	39	41
Changes to the function of office space (shared offices / hired office space)	48	48
Impact on local University Applications	9	16
Impact on local airport Patrons	19	24
Trip frequency changes as a result of trip purposes changing (proportion commute/business vs leisure)	41	44
Time of day changes as a result of trip purposes changing (proportion commute/business vs leisure)	43	43

National Economy / Policy	Score Pre-Consultation	Score Post-Consultation
Gov financial incentives to affected industries	31	35
Potential tax changes (income / VAT) to finance cost of Covid	31	37
Climate change incentives	44	44
Brexit	26	33
Shift in policy (further) towards sustainable/healthier modes (walk/cycle)	48	40

Local Economy / Policy	Score Pre-Consultation	Score Post-Consultation
Impact on Oil Industry now	21	23
Impact of Oil industry recovery post 2020	21	25
Impact on Fishing industry / Harbour Economy	14	13
Delay on committed infrastructure schemes	32	31
Delays in committed/assumed LDP development coming forward	33	33
Shift in policy (further) towards sustainable/healthier modes (walk/cycle)	29	28

Any Further Disruptors?	Score Pre-Consultation	Score Post-Consultation
. The supply of diesel, which I believe we are a net importer of?	12	7
. Trade deals (you reference Brexit, but this not the same thing, we can have Brexit without trade deals)	14	8
. Price of fuel – reductions in cost of fuel due to global demand reducing can lead to changes in vehicle use	16	9
. Passenger capacity – public transport may be operating with significantly limited capacity due to physical distancing for some time to come	12	7
. COVID-19 restrictions and regional differences affecting ability to travel	12	7
Shift in policy based on cities meeting AQ objectives without LEZ intervention in advance of enforcement phase	0	4

B.2 Aberdeen Disruptors

Travel Demand	Score Pre-Consultation	Score Post-Consultation
CAR		
● Travel demand to/from existing premises – commute (e.g. reduced employment)	41	38
● Travel demand to/from existing premises – commute (e.g. more home working)	61	55
● Travel demand to/from existing premises – business travel (e.g. economic downturn)	36	32
● Travel demand to/from existing premises – business travel (e.g. more internet-based)	48	48
● Travel demand to/from existing city-centre premises - shopping (e.g. economic downturn)	37	35
● Car travel demand to/from existing premises - shopping (e.g. more on-line and out-of-town shopping)	53	46
● Travel demand to/from existing premises - other leisure (e.g. economic down-turn and reduced city centre businesses)	25	28
LGV		
● Increase in volume of LGV on network as a result of increase in on-line shopping	34	36
● Reduction in volume of LGV on network as a result of economic downturn	33	29
HGV		
● Reduction in volume of HGV on network as a result of economic downturn	22	22
Taxi		
● Change in taxi demand due to reduction in bus/rail demand	15	18
● Change in taxi demand due to reduction in leisure trips	16	18
● Change in taxi demand due to reduction in business trips	24	26
● Changes to type of new car due to trip purpose changes	12	14

Fleet Composition	Score Pre-Consultation	Score Post-Consultation
PT		
● Impact on rail patronage (related to services and fares)	22	27
● Impact on proposed bus fleet upgrades (existing fleet conversions)	53	55
CAR		
● Increase in New Purchase of Low Carbon Vehicles	33	32
● Decrease in New Purchase of Diesel Vehicles	44	40
● Change in the overall number of people buying new cars	36	31
LGV		
● Increase in EURO 6 new vehicle purchases	28	30
● Change in the overall number of people buying new LGV	34	30
HGV		
● Increase in EURO 6 new vehicle purchases	28	28
● Change in the overall number of people buying new HGV	27	26
● Reduction in volume of HGV on network as a result of economic downturn	26	22

Behavioural Response	Score Pre-Consultation	Score Post-Consultation
Walk / Cycle		
● Proportion of people who have changed mode to walk / cycle during COVID period	30	30
● Proportion of people who are walking / cycling now, who will continue to do so, post-covid	16	16
PT		
● Bus users switch to private car	42	43
● Impact on bus patronage (related to social distancing factors)	43	48
● Impact on bus patronage (related to services and fares)	31	38
Rail		
● Rail passengers switch to private car	35	34
● Impact on rail patronage (related to social distancing factors)	29	33
Car		
● Car occupancy levels reduce as people travel in separate cars	34	35
● Car occupancy levels increase as car share increases due to switch from bus / rail	22	23
Taxi		
● Bus and rail passengers switch to Taxi e.g. vulnerable members of the public	10	13

LEZ Concept	Score Pre-Consultation	Score Post-Consultation
● Public appetite for Air Quality measures post covid?	42	37
● Public acceptance post-implementation?	32	32

Travel pattern	Score Pre-Consultation	Score Post-Consultation
● Potential changes to Parking Policy	42	39
● Changes to LGV trips across the whole network (residential deliveries)	38	37
● Changes to the function of office space (shared offices / hired office space)	49	46
● Impact on local University Applications	16	17
● Impact on local airport Patrons	32	34
● Trip frequency changes as a result of trip purposes changing (proportion commute/business vs leisure)	45	41
● Time of day changes as a result of trip purposes changing (proportion commute/business vs leisure)	44	40

National Economy / Policy	Score Pre-Consultation	Score Post-Consultation
● Gov financial incentives to affected industries	31	31
● Potential tax changes (income / VAT) to finance cost of Covid	38	36
● Climate change incentives	32	33
● Brexit	37	36
● Shift in policy (further) towards sustainable/healthier modes (walk/cycle)	35	37

Local Economy / Policy	Score Pre-Consultation	Score Post-Consultation
● Impact on Oil Industry now	41	37
● Impact of Oil industry recovery post 2020	37	32
● Impact on Fishing industry / Harbour Economy	26	27
● Delay on committed infrastructure schemes	35	36
● Delays in committed/assumed LDP development coming forward	42	42
● Shift in policy (further) towards sustainable/healthier modes (walk/cycle)	34	30

Any Further Disruptors?	Score Pre-Consultation	Score Post-Consultation
● The supply of diesel, which I believe we are a net importer of?	8	6
● Trade deals (you reference Brexit, but this not the same thing, we can have Brexit without trade deals)	8	6
● Price of fuel – reductions in cost of fuel due to global demand reducing can lead to changes in vehicle use	9	6
● Passenger capacity – public transport may be operating with significantly limited capacity due to physical distancing for some time to come	7	5
● COVID-19 restrictions and regional differences affecting ability to travel	7	5
● Uncertainty of air quality changes and likelihood and extent of exceedance of air quality objectives	9	6
● Road space reallocation for public transport or active travel (ie infrastructure rather than just policy)	0	6

B.3 Edinburgh Disruptors

Travel Demand	Score Pre-Consultation	Score Post-Consultation
CAR		
● Travel demand to/from existing premises – commute (e.g. reduced employment)	17	17
● Travel demand to/from existing premises – commute (e.g. more home working)	26	26
● Travel demand to/from existing premises – business travel (e.g. economic downturn)	18	18
● Travel demand to/from existing premises – business travel (e.g. more internet-based)	24	24
● Travel demand to/from existing city-centre premises - shopping (e.g. economic downturn)	19	19
● Car travel demand to/from existing premises - shopping (e.g. more on-line and out-of-town shopping)	24	24
● Travel demand to/from existing premises - other leisure (e.g. economic down-turn and reduced city centre businesses)	17	17
LGV	0	0
● Increase in volume of LGV on network as a result of increase in on-line shopping	26	26
● Reduction in volume of LGV on network as a result of economic downturn	7	7
HGV	0	0
● Reduction in volume of HGV on network as a result of economic downturn	7	7
Taxi	0	0
● Change in taxi demand due to reduction in bus/rail demand	24	24
● Change in taxi demand due to reduction in leisure trips	17	17
● Change in taxi demand due to reduction in business trips	18	18
● Changes to type of new car due to trip purpose changes	17	17
	0	0

Fleet Composition	Score Pre-Consultation	Score Post-Consultation
PT		
● Impact on rail patronage (related to services and fares)	18	18
● Impact on proposed bus fleet upgrades (existing fleet conversions)	22	22
CAR	0	0
● Increase in New Purchase of Low Carbon Vehicles	20	20
● Decrease in New Purchase of Diesel Vehicles	20	20
● Change in the overall number of people buying new cars	26	26
LGV	0	0
● Increase in EURO 6 new vehicle purchases	23	23
● Change in the overall number of people buying new LGV	22	22
HGV	0	0
● Increase in EURO 6 new vehicle purchases	18	18
● Change in the overall number of people buying new HGV	14	14
● Reduction in volume of HGV on network as a result of economic downturn	11	11

Behavioural Response	Score Pre-Consultation	Score Post-Consultation
Walk / Cycle		
● Proportion of people who have changed mode to walk / cycle during COVID period	19	19
● Proportion of people who are walking / cycling now, who will continue to do so, post-covid	18	18
PT		
● Bus users switch to private car	26	26
● Impact on bus patronage (related to social distancing factors)	28	28
● Impact on bus patronage (related to services and fares)	18	18
Rail	0	0
● Rail passengers switch to private car	21	21
● Impact on rail patronage (related to social distancing factors)	27	27
Car	0	0
● Car occupancy levels reduce as people travel in separate cars	26	26
● Car occupancy levels increase as car share increases due to switch from bus / rail	14	14
Taxi	0	0
● Bus and rail passengers switch to Taxi e.g. vulnerable members of the public	8	8

LEZ Concept	Score Pre-Consultation	Score Post-Consultation
● Public appetite for Air Quality measures post covid?	14	14
● Public acceptance post-implementation?	16	16

Travel pattern	Score Pre-Consultation	Score Post-Consultation
● Potential changes to Parking Policy	18	18
● Changes to LGV trips across the whole network (residential deliveries)	28	28
● Changes to the function of office space (shared offices / hired office space)	19	19
● Impact on local University Applications	22	22
● Impact on local airport Patrons	13	13
● Trip frequency changes as a result of trip purposes changing (proportion commute/business vs leisure)	18	18
● Time of day changes as a result of trip purposes changing (proportion commute/business vs leisure)	20	20

National Economy / Policy	Score Pre-Consultation	Score Post-Consultation
● Gov financial incentives to affected industries	19	19
● Potential tax changes (income / VAT) to finance cost of Covid	16	16
● Climate change incentives	19	19
● Brexit	18	18
● Shift in policy (further) towards sustainable/healthier modes (walk/cycle)	23	23

Local Economy / Policy	Score Pre-Consultation	Score Post-Consultation
● Impact on Oil Industry now	16	16
● Impact of Oil industry recovery post 2020	14	14
● Impact on Fishing industry / Harbour Economy	20	20
● Delay on committed infrastructure schemes	18	18
● Delays in committed/assumed LDP development coming forward	25	25
● Shift in policy (further) towards sustainable/healthier modes (walk/cycle)	24	24

B.4 Glasgow Disruptors

Travel Demand	Score Pre-Consultation	Score Post-Consultation
CAR		
● Travel demand to/from existing premises – commute (e.g. reduced	42	36
● Travel demand to/from existing premises – commute (e.g. more	46	41
● Travel demand to/from existing premises – business travel (e.g.	38	33
● Travel demand to/from existing premises – business travel (e.g.	38	34
● Travel demand to/from existing city-centre premises - shopping (e.g.	39	34
● Car travel demand to/from existing premises - shopping (e.g. more	44	39
● Travel demand to/from existing premises - other leisure (e.g.	37	32
LGV		
● Increase in volume of LGV on network as a result of increase in on-lir	34	33
● Reduction in volume of LGV on network as a result of economic dow	16	14
HGV		
● Reduction in volume of HGV on network as a result of economic dow	10	9
Taxi		
● Change in taxi demand due to reduction in bus/rail demand	25	22
● Change in taxi demand due to reduction in leisure trips	38	33
● Change in taxi demand due to reduction in business trips	35	31
● Changes to type of new car due to trip purpose changes	12	10

Fleet Composition	Score Pre-Consultation	Score Pre-Consultation
PT		
● Impact on rail patronage (related to services and fares)	24	23
● Impact on proposed bus fleet upgrades (existing fleet conversions)	54	51
CAR		
● Increase in New Purchase of Low Carbon Vehicles	43	37
● Decrease in New Purchase of Diesel Vehicles	49	42
● Change in the overall number of people buying new cars	42	36
LGV		
● Increase in EURO 6 new vehicle purchases	29	26
● Change in the overall number of people buying new LGV	23	20
HGV		
● Increase in EURO 6 new vehicle purchases	20	18
● Change in the overall number of people buying new HGV	23	20
● Reduction in volume of HGV on network as a result of economic dow	13	13

Behavioural Response	Score Pre-Consultation	Score Pre-Consultation
Walk / Cycle		
● Proportion of people who have changed mode to walk / cycle during	30	28
● Proportion of people who are walking / cycling now, who will continu	28	25
PT		
● Bus users switch to private car	46	44
● Impact on bus patronage (related to social distancing factors)	57	53
● Impact on bus patronage (related to services and fares)	30	30
Rail		
● Rail passengers switch to private car	34	31
● Impact on rail patronage (related to social distancing factors)	30	27
Car		
● Car occupancy levels reduce as people travel in separate cars	34	31
● Car occupancy levels increase as car share increases due to switch fr	18	17
Taxi		
● Bus and rail passengers switch to Taxi e.g. vulnerable members of the	19	16

LEZ Concept	Score Pre-Consultation	Score Pre-Consultation
● Public appetite for Air Quality measures post covid?	40	35
● Public acceptance post-implementation?	37	34

Travel pattern	Score Pre-Consultation	Score Pre-Consultation
● Potential changes to Parking Policy	49	46
● Changes to LGV trips across the whole network (residential deliveries	32	31
● Changes to the function of office space (shared offices / hired office	54	47
● Impact on local University Applications	15	15
● Impact on local airport Patrons	33	29
● Trip frequency changes as a result of trip purposes changing (proporti	46	39
● Time of day changes as a result of trip purposes changing (proportion	49	41

National Economy / Policy	Score Pre-Consultation	Score Pre-Consultation
● Gov financial incentives to affected industries	45	43
● Potential tax changes (income / VAT) to finance cost of Covid	44	37
● Climate change incentives	48	42
● Brexit	46	42
● Shift in policy (further) towards sustainable/healthier modes (walk/cy	53	47

Local Economy / Policy	Score Pre-Consultation	Score Pre-Consultation
● Delay on committed infrastructure schemes	47	41
● Delays in committed/assumed LDP development coming forward	36	33
● Shift in policy (further) towards sustainable/healthier modes (walk/cy	40	35
● Impact on Investment	41	40
● Impact on retail	46	47
● Impact on tourism - resident v visitor	37	34

Any Further Disruptors?	Score Pre-Consultation	Score Pre-Consultation
● Increased use of e-transport: e-cargo, e-bikes etc	11	11
● Increased use of sustainable energy generation	15	15
● Business resistance to LEZ measures	15	15
● Leadership commitment	10	10
● Delays / Lack of Policy Impact on Public Health	15	15
● Incentives to Change	1	1
● Leadership Clarity	0	0
● Move towards 20minute neighbourhoods or LTN's	4	4
● Lack of Public Confidence in Government\Local Authorities	0	7
● Current and future car tax levels (£40000=extra 350 per year) &	0	0
● Require improved public transport system to be choice (peak issues f	0	1
● How would current PT cope with required 30% car reduction = 25,000	0	1
● Lack opf progress in electric car development (necessity may speed p	0	1

APPROVAL					
Version	**Name**		**Position**	**Date**	**Modifications**
1	Author	Malcolm Neil/ Grant Davidson/ Callum Guild		18/12/2020	
	Checked by	Keith Gowenlock/Grant Davidson		19/12/2020	
	Approved by	Boris Johansson		21/12/2020	
2	Author	Malcolm Neil/ Grant Davidson/ Callum Guild		20/01/2021	Updated following feedback
	Checked by	Keith Gowenlock/Grant Davidson		20/01/2021	
	Approved by	Malcolm Neil		20/01/2021	
3	Author	Grant Davidson/ Callum Guild		21/01/2021	Updated following comments
	Checked by	Malcolm Neil		22/01/2021	
	Approved by	Malcolm Neil		22/01/2021	
4	Author	Callum Guild		28/01/2021	Updated following comments
	Checked by	Malcolm Neil		28/01/2021	
	Approved by	Malcolm Neil		28/01/2021	
5	Author	Callum Guild		29/01/2021	Executive Summary Added
	Checked by	Malcolm Neil		29/01/2021	
	Approved by	Malcolm Neil		29/01/2021	

The City of Edinburgh Council

Low Emission Zone (LEZ) Enforcement Strategy

April 2021

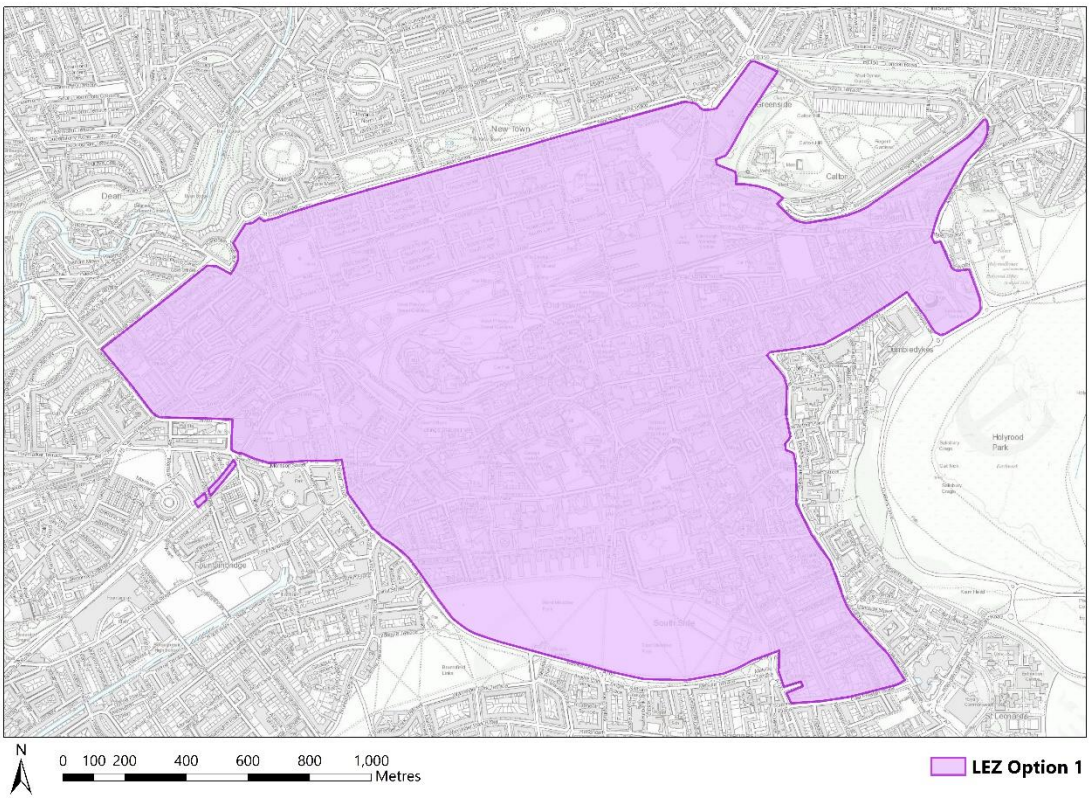
Aims

The Council is introducing a LEZ and this strategy aims to ensure that enforcement of the new restrictions will;

- Ensure compliance with the LEZ is achieved and meets the wider objectives of the scheme,
- Be financially affordable and minimise unnecessary costs, and
- Be flexible so that equipment can be adapted to meet the evolving needs of the scheme or for different purposes as needs change over time.

Background

The Council is proposing a city centre LEZ which has an area of approximately 3km^2 with a potential 48 vehicular entry points. The map below indicates the approximate city centre boundary:



Scottish LEZ's are a penalty enforcement regime. This means that penalty charges are set at an ever-increasing rate to change behaviour and stop people driving non-compliant vehicles within a LEZ. The highest charge in the seven-band structure for a private car may be £480 for one contravention.

This is different to the approach being taken by Clean Air Zones (CAZs) in England which are more comparable to an access charge (or toll) scheme, where if paid, a fixed daily rate (i.e. £12.50 in London) a penalty charge is avoided. In Scotland, there is no option to pay a daily fee.

Therefore, it is considered that compliance will be much higher in Scotland than in England and as a result income will be lower so implementation and operating costs will need to be carefully considered

to prevent the Council from future financial pressures. Indeed, Transport Scotland has advised that Councils should prepare for a net zero income from enforcement penalty charges.

Furthermore, there are numerous national exemptions and the Council can also introduce local time-limited exemptions, such as grace periods for local residents.

The LEZ will be based on the Euro emission engine classification standards – the proposed minimum criteria is:

Euro six for diesel cars – from September 2015

Euro four for petrol cars – from January 2006

Euro VI for heavy diesel vehicles (including older retrofitted engines which would be improved to operate as Euro VI) – from 2005.

These factors all contribute to an ever-decreasing pool of vehicles that will likely need to be detected, have their compliance checked and ultimately if necessary be issued with a penalty charge.

Enforcement Approaches

Enforcement of moving traffic offences greatly benefits from the emergence of Automatic Number Plate Recognition (ANPR) technology and this is extremely well suited for the enforcement LEZs. Cameras, linked to a vehicle database(s), can monitor vehicles driving in a LEZ to detect those which do not comply with the minimum Euro emission standards. Those which also do not qualify for an exemption can then be issued with a penalty charge by post, with payment being made online or further appeal to an Adjudicator.

Software Systems

While the market is relatively small in terms of ANPR suppliers, the Council already works with two of them (Siemens and Videalert) for its bus lane camera enforcement and research indicates that the market is capable of delivering what is required for Edinburgh to enforce its LEZ.

However, the penalty surcharge structure proposed by Transport Scotland is different to any other systems in operation. As such, suppliers will need to develop new or existing software to accommodate this penalty structure. Our current operators are aware of this, but this is likely to incur further costs for the Council to procure such systems. This is estimated at up to **£75K.**

Camera Units

The prices of ANPR hardware can vary substantially depending on the specification of the equipment required. For the purposes of LEZ enforcement, this is likely to be towards the higher end of the range at around **£20K** per device.

Installation

Based on the recent introduction of new bus lane cameras in Edinburgh, installation costs are likely to be on average around **£5K** per site. However, there's a risk this figure can increase greatly if there are additional power connections required and enabling civils work being required.

Mobile Enforcement

Mobile Enforcement Vehicles (MEVs), include hybrid and electric powered cars and electric bikes, have the capability to provide attended and unattended camera enforcement solutions and can be used for LEZ enforcement.

As an example, Videalert utilises mobile ANPR technology with two roof-mounted ANPR cameras and two colour cameras to capture contextual video evidence. The on-board systems are controlled by the operator manning the vehicle using a dashboard-mounted touchscreen. All recorded data is transferred in the office at the end of each shift. The system automates the construction of evidence packs which are reviewed by trained operatives prior to sending contraventions to the back-office

processing system for the issuance of a PCN. These vehicles can also be used for a wide range of other traffic and parking management applications, more of which are discussed later in this report.

The price of an electric and fully equipped MEV is expected to be around **£75K**, this does not include staff/driver costs.

Enforcement Options

There are five possible options that could be considered for enforcement.

1. All entry points have cameras;
2. Only main routes have cameras;
3. Only main routes have cameras, all others have the infrastructure installed and are covered on a periodic basis by moveable/mobile cameras;
4. Only main routes have cameras with other infringements detected by mobile enforcement vehicle(s);
5. No cameras provided at entry points.

Option 1 – All entry points have cameras.

Fixed camera locations at every vehicular entry point to the LEZ has the greatest impact on ensuring compliance as non-compliant vehicles cannot access the area without the possibility of being issued with a penalty charge notice. This may have the greatest impact on ensuring compliance, improving air quality and income potential, but likely at the highest cost.

This option is considered the most robust to enforce the zone but wouldn't detect vehicles which only drive within the zone, will contribute to a considerable increase in street furniture and fixed camera enforcement is not flawless. Given the expectation that there will be 48 entry points to the city centre LEZ the implementation costs would be significant.

Option 1	Units	Unit Price	Total
Software	1	£75,000	£75,000
Cameras	48	£20,000	£960,000
Sites	48	£5,000	£240,000
MEV	0	£75,000	£0
Total	-	-	£1,275,000

Option 2 – Only main routes have cameras.

Placing cameras on only the main routes would capture the majority of vehicles driving into the LEZ each day, but could result in lower compliance and displacement onto minor roads as drivers attempt to evade detection points. However, implementation costs would be considerably cheaper as fewer cameras and fixed locations would be required to enforce the zone.

Option 1	Units	Unit Price	Total
Software	1	£75,000	£75,000
Cameras	16	£20,000	£320,000
Sites	16	£5,000	£80,000
MEV	0	£75,000	£0
Total	-	-	£475,000

Option 3 – Only main routes have cameras, all others have the infrastructure installed and are covered on a periodic basis by moveable/mobile cameras.

Similar to Option 2, but with the necessary infrastructure still introduced at each vehicular entry point so that cameras may be moved between fixed locations. This approach is similar to that used for speed Safety Cameras. This reduces the likelihood of drivers believing they can avoid detection and may prevent displacement to quieter routes.

However, while implementation costs are reduced as fewer camera units need to be procured, fixed locations still need to be introduced at each point and this will cost an additional £160,000. This is a considerable investment considering some locations may only be used infrequently as it may be hard to justify removing a camera from a main route. Moveable and/or mobile cameras are in theory a sensible option, but re-deployable devices still need connected to a mains power supply and the only known power supply for a mobile device is by means of a generator (placing a large petrol driven generator on the adjacent footway presents its own health and safety concerns and air quality impacts). Thus, such an approach does not provide the flexibility that is first envisaged.

Furthermore, additional resources (engineers and staff time) would be required to regularly monitor camera performance, develop and maintain a rota of camera positions and to ultimately move the units from site to site.

Option 1	Units	Unit Price	Total
Software	1	£75,000	£75,000
Cameras	16	£20,000	£320,000
Sites	48	£5,000	£240,000
MEV	0	£75,000	£0
Total	-	-	£635,000

Option 4 - Only main routes have cameras with other infringements detected by mobile enforcement vehicle(s).

Similar to Option 3, but without the added expense of installing infrastructure which is unlikely to be used or cover its implementation costs.

This option ensures that financial resources are targeted where required the most, on the main routes, but provides the desired flexibility and an enhanced deterrent factor to all motorists that they may still be captured driving a non-compliant vehicle in the LEZ even when avoiding main roads. This approach can also future proof the investment to some extent as an MEV can be used for a variety of other purposes and are easily re-deployable unlike fixed camera infrastructure.

Option 1	Units	Unit Price	Total
Software	1	£75,000	£75,000
Cameras	16	£20,000	£320,000
Sites	16	£5,000	£80,000
MEV	1	£75,000	£75,000
Total	-	-	£550,000

Option 5 – No cameras provided at entry points.

A final option is not to provide any enforcement cameras. This is the do-nothing, low-cost option but is unlikely to have any impact on ensuring compliance or achieving the aims of the LEZ and improving air quality in Edinburgh.

Option 1	Units	Unit Price	Total
Software	0	£75,000	£0
Cameras	0	£20,000	£0
Sites	0	£5,000	£0
MEV	0	£75,000	£0
Total	-	-	£0

Recommendation

While not the cheapest of all the options, **Option 4** is considered to offer the best value to the Council. It has a large deterrent effect and will change behaviour whilst also having the desired flexibility to adapt to future changes and enforcement needs.

Operational Costs

Once the scheme is up and running, there will be costs associated with day to day operations. Depending on the contract setup, these could include:

- Staff
- Monitoring and evaluation
- Telecoms and power
- Maintenance
- Licensing fees and charges (i.e. DVLA)
- Stationery and postage

As with the implementation costs, the running costs will depend on the Option selected. As Edinburgh currently has existing software and systems that could be used for enforcement of the LEZ and potentially could have fewer cameras, costs are estimated to be in the region of £400k to £700k per year.

Penalty Charge Notices

It is difficult to forecast potential numbers of PCNs issued as the LEZ is a penalty scheme, as opposed to an access charge, and there are no known similar schemes in operation anywhere else. The issue of PCNs also depends on national and any local exemptions, the number of cameras deployed and valid data on the composition of the Edinburgh vehicle fleet. Finance are working on a detailed financial model.

There is also the factor that disabled persons' blue badge holders will be exempt from the charge, but it is not yet clear how Transport Scotland expect Councils to manage this exemption, since the badge is issued to a person and is transferable between any vehicle. It is questionable whether this would apply to all vehicles, such as HGVs, or just to private cars.

However, research is available and London's ULEZ has been operating for some time, so these can help inform some conclusions.

After the first six months of operation of the London scheme, the average compliance rate within the area was 77%. This is significantly higher than prior to its implementation.

The table below shows the proportions of those vehicles which would be compliant within Edinburgh's LEZ emissions standards. These are lower than the national fleet by 7%. Using this data, it is possible that 68% of vehicles will be compliant and be able to enter the city centre zone. This data also shows that by 2029 it is predicted that all vehicle types will be compliant with current LEZ emissions standards, furthermore, for most types this is expected to be achieved by 2025.

That said, SEPA's initial Edinburgh Air Quality evidence report states national vehicle fleet predictions should be treated with caution as they have not been found to be accurate for all vehicle types across a range of Scottish cities, including Edinburgh. Data from traffic surveys undertaken in 2019 indicated that some fleet predictions were up to 25% out.

Emissions Compliance Table

% emissions compliance	Cars	LGV's	Buses	Rigid HGVs	Artic HGVs
2019 Actual	69.1%	40.60%	52.1%	64.9%	83.3%
Annual Change	+4.3%	+10.2%	+9.7%	+6.2%	+3.3%
2029 Projected	105.5	107.4	131.3	118.2	115

A further example from London demonstrates that on an average day in September 2019 around 27,044 non-compliant, unique vehicles were detected in the zone. Of these, 52% paid the charge, 38% were not required to pay (either exempt or eligible for a 100% discount) and only 10% were in contravention and issued a penalty charge.

The data suggests that there is existing trends in improving vehicle compliance and as there is no ability to pay an access charge and with the high penalty charge rates in Scotland, there is not expected to be many PCNs issued. In addition, this number is expected to fall dramatically should motorists receive their first charge and be made aware of the escalating surcharges. This outlook supports the aim to introduce fewer fixed location ANPR cameras as they may become virtually redundant for LEZ enforcement in the near future. There would continue to be ongoing costs of checking vehicles entering the LEZ remain compliant but with little scope to recover any income and fund the continued use of the scheme.

ANPR System Performance

The successful operation of ANPR technology relies upon carefully selected sites and well positioned cameras and these are not always possible for a number of reasons. Moreover, there are a variety of external factors that can cause detection problems, such as;

- Dirty or unclear number plates
- Damaged or incorrectly displayed/positioned number plates
- Vehicles switching lanes within the detection area
- Number of lanes being monitored
- Vehicles tailgating
- Queuing traffic and
- Insufficient illumination (natural light or infrared).

Alternative Uses

As discussed previously, should compliance improve considerably and as quickly as predicted then there needs to be flexibility of use regarding the hardware being procured so this can be repurposed if the LEZ develops or for other tasks. ANPR cameras are well suited for LEZ enforcement purposes but can also be used for many other transport and traffic management task. Tying in with the Council's CCTV and Smart Cities programmes would also be of benefit.

End/…

Section 4 Integrated Impact Assessment

Summary Report Template

Each of the numbered sections below must be completed

Interim report	x	Final report	

(Tick as appropriate)

1. Title of proposal

Edinburgh Low Emission Zone

2. What will change as a result of this proposal?

A draft IIA for the proposed LEZ in Edinburgh was previously undertaken in October 2019 to assess the impact of the original scheme. This report provides an update as a considerable amount of time has passed since the previous IIA was carried out, taking cognisance of changes to the scheme. This IIA was supplemented by a detailed impact assessment and fleet analysis for the Edinburgh Travel to Work Area, providing more detail on the baseline and impacts of the proposed scheme.

In 2015, the Scottish Government made a commitment to significantly improve Scotland's air quality through the 'Cleaner Air for Scotland' strategy, where Low Emission Zones (LEZ) were identified as a potential tool within the strategy. LEZs are to be introduced across Glasgow, Edinburgh, Dundee and Aberdeen between February 2022 and May 2022. Plans to implement LEZs were temporarily paused due to the COVID-19 outbreak, but work has now restarted.

The air quality standard the LEZs are based on are the Euro emissions standards. To enter/exit/operate within a LEZ in Scotland, a diesel vehicle will need to be Euro 6 (generally those registered from September 2015) and a petrol vehicle Euro 4 (generally those registered from January 2006).

Vehicles that do not meet the emission standard set for a LEZ will not be able to enter the zone. A penalty charge will be payable by the vehicle's registered keeper when a non-compliant vehicle enters the LEZ. The initial penalty charge for all non-compliant vehicles is set at £60, reduced by 50% if it is paid within 14 days. A surcharge is also proposed whereby the penalty amount doubles with each subsequent breach of the rules detected in the same LEZ. The penalty charges are capped at £480 for cars and light goods vehicles (LGVs), and £960 for buses and heavy goods vehicles (HGVs). Where there are no further breaches of the rules detected within the 90 days following a previous violation, the surcharge rate is reset to the base tier of charge i.e. £60.

The proposed boundary is the originally proposed City Centre boundary as presented in 2019 for consultation. The Citywide boundary, as presented in 2019, has been excluded from the proposal following options appraisal. The proposed grace period for all vehicles (for residents and non-residents) is two years, which differs from the 2019 proposal, where a one year grace period was proposed for commercial-type vehicles (HGVs, LGVs, buses and minibuses, coaches and taxis), with a proposal of four years for cars. Enforcement of the LEZ begins after the grace period expires.

Exemptions apply consistently across all Scottish LEZs, as set out in the Regulations. These exemptions must be applied to the LEZ at all times and include:

- Police vehicles
- Ambulance and emergency vehicles
- Scottish Fire and Rescue

- Her Majesty's Coastguard
- National Crime Agency
- Military vehicles
- Vehicles for disabled persons (persons 'disabled' or 'disabled passenger vehicles' tax class; Blue Badge Scheme)
- Historic vehicles
- Travellers and Showman's vehicles

Several grants and loans are available which are funded Transport Scotland and administered by the Energy Saving Trust, to supports individuals and businesses affected by the LEZ.

- **Low Emission Zone Support Fund and Travel Better funding –** Offers a grant of £2000 for low-income households to take older, more polluting vehicles off the road**.** To be eligible, households must meet all the following criteria; be on specific means tested benefits (listed below), own a non-compliant car (which has been owned by them for at least 12 months with no outstanding finance), and live within a 20km radius of a planned LEZ.

  The list of eligible benefits are as follows:

  - Attendance Allowance
  - Carer's Allowance
  - Child Tax Credit; Council Tax Benefit (excluding 25 per cent discount)
  - Disability Living Allowance
  - Employment and Support Allowance
  - Income-based Job Seeker Allowance
  - Income Support; Pension Credit
  - Personal Independence Payment
  - Universal Credit
  - Working Tax Credit.

  Eligible households which have successful claimed, can also apply for a further £1,000 Travel Better funding for sustainable travel alternatives. Eligible travel measures include bus passes, train season tickets, new and used bikes, as well as car club membership and credits.

- **Low Emission Zone Support Fund for Businesses** - Micro businesses and sole traders can apply for a £2,500 grant towards the safe disposal of vehicles that do not meet the zone standards. Businesses must meet all the following criteria; have an operating site within 20km of the planned zone, own a non-compliant vehicle (they must have owned the vehicle for at least 12 months and utilised it for business operational purposes) and meet the definition of a micro business (employ nine or fewer full-time employees and have a turnover of £632,000 or less, or a balance sheet of up to £316,000 in the preceding and current financial year).
- **Low Emission Zone Retrofit Fund** - Provides micro businesses and sole traders, who operate within the planned LEZ, with support to retrofit their existing non-compliant vehicles with Clean Vehicle Retrofit Accreditation Scheme (CVRAS) approved solutions that meet the minimum proposed standards of the LEZ. Businesses must meet all the following criteria; meet the definition of a microbusinesses (employ nine or fewer full-time employees and have a turnover of £632,000 or less, or a balance sheet of up to £316,000 in the preceding and current financial year), must not be VAT registered, must own a non-compliant vehicle which is no more than 13 years old (they must have owned it for at least 12 months), and the vehicle must operate at least weekly in the planned LEZ. In addition, the vehicle must also have an approved CVRAS retrofit solution available for the exact make and model and be one of the following:
  - Wheelchair accessible taxi
  - Light commercial vehicles – vehicles designed to carry goods that weight less than 3.5 tonnes
  - Heavy goods vehicles – vehicles designed to carry goods that weigh 3.5 tonnes or more
  - Refuse collection vehicles – vehicles specially designed to collect and transport solid waste.

  Grants to support the cost of a retrofit solution are available as follows:
  - light commercial vehicles – 80% of the cost, up to a maximum of £5,000

    - taxis – 80% of the cost, up to a maximum of £10,000
    - heavy goods vehicles and refuse collection vehicles – 80% of the cost, up to a maximum of £16,000.
- **The Bus Emissions Abatement Retrofit Programme** - Supports bus and coach operators with the cost to retrofit vehicles with Clean Vehicle Retrofit Accreditation Scheme (CVRAS) technology to a Euro VI standard or better. This funding is available to licensed bus and coach operators, local authorities and community transport operators located in or that operate on routes within Scotland's cities identified for LEZ's and/or one of Scotland's AQMAs. Successful applicants can access grant funding towards both primary and ancillary costs up to a maximum of £3,500,000 per bidder.

  Eligible vehicles must meet the following criteria:

    - buses and coaches operating under a Public Service Vehicle (PSV) operator licence or used for voluntary, community or other non-profit making purpose
    - less than 13 years old at time of application
    - a remaining service life of at least 5 years in Scotland
    - conforming to Euro IV or V emission standards from factory

A number of other grants and schemes are also available to individuals and businesses wishing to switch to more sustainable travel modes, which could be used to support those affected by the LEZ:

- **eBike Loan -** Interest-free loans to help individuals purchase a new electric bike, family cargo or ecargo bike, or adaptive bike. A wide range of models and adaptations are available including tricycles, tandems, hand cycles and recumbent cycles.
- **Used Electric Vehicle Loan -** The interest-free Used Electric Vehicle Loan offers up to £20,000 to cover the cost of purchasing a used electric car or up to £5,000 for the purchase of a used electric motorcycle or moped. The loan has a repayment term of up to five years.
- **Electric Vehicle Loan -** Interest-free loans of up to £28,000 to cover the cost of purchasing a new, pure electric vehicle or up to £10,000 to cover the cost of purchasing a new electric motorcycle or moped. The loan has a repayment term of up to six years.
- **Domestic charge point funding -** Energy Saving Trust and the Office for Zero Emission Vehicles currently offers applicants £350 towards the cost of a home charge point and Energy Saving Trust will provide up to £250 further funding on top of this, with an additional £100 available for those in the most remote parts of Scotland.
- **eBike Business Loan -** Interest-free loans of up to £30,000 are available to support organisations that want to reduce the carbon impact of their transport and travel arrangements with new and more efficient alternatives. The loan covers new pedal-assisted electric bikes (up to £3,000 per bike), new cargo bikes (up to £6,000 per bike) and new adapted cycles.
- **Low Carbon Transport Business Loan -** Interest-free loans of up to £120,000 are available to Scottish businesses. The loans can be used to meet the cost of a wide range of sustainable measures to lower business transport carbon footprint including: pure electric vehicles (cars and vans - up to £28,000 for each new electric vehicle), new electric motorcycles or scooters (up to £10,000 for each vehicle), new electric / plug-in hybrid HGVs (up to £50,000 for each HGV).
- **Business charge point funding -** Funding to help organisations install electric vehicle (EV) charging infrastructure on their premises. Funding is currently available for charge points for sole use by occupiers, staff and visitors.
- **Switched on Taxi loan -** Interest-free loans of up to £120,000 are available to enable owners and operators of hackney cabs or private hire taxis to replace their current vehicle with an eligible ultra-low emission vehicle.
- **Used Electric Vehicle Loan for Business -** The interest-free Used Electric Vehicle Loan offers businesses in Scotland up to £20,000 to cover the cost of purchasing a used electric car, up to £20,000 for a used electric or plug-in hybrid electric van, up to £5,000 for a used electric motorcycle or moped.

3. Briefly describe public involvement in this proposal to date and planned

Between May and July 2019, the Council publicly consulted on LEZ proposals in Edinburgh. The consultation approach included:

- An online survey (which received 2,793 responses).
- A series of sessions with key stakeholder including the representatives from the taxi and private hire car sectors, the bus and coach sectors, and with freight sectors though the Council's ECO Stars scheme
- Engagement with wider general stakeholder groups (including health and environmental, and wider interest groups, community councils, and residents).
- Written responses from stakeholder groups and members of the public.
- Engagement with 60 primary school children
- Engagement with neighbouring local authorities in the South East Scotland region.

As part of the IIA undertaken in 2020, in-depth interviews were undertaken with business owners, business and trade representative organisations and community transport providers.

To provide input to this updated IIA, meetings were held in May/June 2021 with representatives from the Edinburgh Access Panel and Inclusion Scotland, as well as Officers working on the Council's Poverty Action Plan.

Engagement with these groups will continue as the project further refines LEZ proposals.

4. Is the proposal considered strategic under the Fairer Scotland Duty?

Yes

5. Date of IIA

A full scoping meeting on the original proposals was held in 24/06/2019. As a considerable amount of time has passed since the previous IIA was carried out and changes have been made to the proposed scheme, a second meeting was held on 20/05/21 to inform this updated IIA.

6. Who was present at the IIA? Identify facilitator, Lead Officer, report writer and any partnership representative present and main stakeholder (e.g. NHS, Council)

Name	Job Title	Date of IIA training
Suzanne Hunter	Transport Officer	01 Nov 2018
Shauna Clarke	Environmental Health Officer	
Greg McDougal	Transport Officer	

7. Evidence available at the time of the IIA

Evidence	Available – detail source	Comments: what does the evidence tell you with regard to different groups who may be affected?
Data on populations in need	Census 2011 The National Records of Scotland 2017 and 2018 DfT, April 2019 Jacobs, Edinburgh Low Emission Zone Integrated Impact Assessment, 2020	The City of Edinburgh has one of the fastest growing populations of any city in the UK. Although the city has a lower share of its population over 65 years of age (12%), the wider city region has a significantly higher share (22%) than Edinburgh and Scotland (19%). Based on 2011 Census Data, the wards with the highest number of health conditions (including Deafness, Blindness, Physical, mental health conditions, learning disabilities etc.) were at Portobello/Craigmillar and Liberton/Gilmerton wards. Both had 31% of their total reporting health conditions. The City Centre had the lowest proportion (22%). According to The National Records of Scotland 2017 mid-year estimate, 15% of inhabitants in Edinburgh reported a limiting long-term health problem or disability that limited their day-to-day activities The total number of vehicles in the City of Edinburgh with Disabled Tax Code (Class code 78) was 7,000 and the total number of vehicles in the City classed as Disabled Passenger Carrying Vehicles were about 100. Higher proportion of disabled tax vehicles are present in Portobello/Craigmillar ward and Liberton/Gilmerton ward located along the south eastern side of Edinburgh.
Data on service uptake / access	Census 2011 Transport Scotland, 2019, Scottish Transport Statistics (No 32-37) Editions 2012 to 2018 Transport Scotland, 2019, Scottish Transport Statistics, 2018 (No 37) DVLA (2018). Number of licensed vehicles at the end of the quarter by bodytype, fuel type and estimated euro status, Edinburgh City UA. AECOM, 2014. Van travel trends in Great Britain, prepared for RAC foundations,	Car use in Edinburgh is the joint lowest of all Scottish cities. In 2010 of the 191,000 people living and working in Edinburgh, 63,500 commuted to work by car and a further 63,300 commuted by car from other local authority areas. LGVs are the fastest growing vehicle category in Scotland, up by 26% over the past ten years, to reach 294,000 vehicles in 2018. This trend is also evident across Great Britain where every tenth vehicle on the road is an LGV. Small enterprises represent over 90% of businesses in Edinburgh. 63% of companies rely upon vehicles, most likely LGVs, to deliver goods or drive to clients to provide a service. In the UK, 53% of LGVs are privately owned and 47% are commercially owned, however it is likely that many privately owned LGVs are also used for business purposes. For company-owned LGVs, most vehicle kms travelled are for collecting or

Evidence	Available – detail source	Comments: what does the evidence tell you with regard to different groups who may be affected?
	RHA, Clean Air Zones and HGVs – factsheet (BVRLA,FTA, NFDA and RHA, Scottish Government, 2018, Businesses in Scotland Clean Air Zones and HGVs – factsheet, 2019 (BVRLA,FTA, NFDA and RHA) Transport Scotland, 2019, Scottish Transport Statistics (No 32-37) Editions 2012 to 2018) National Atmospheric Emissions Inventory (2018), Vehicle fleet composition projections DVLA database on vehicles registered in the Edinburgh TTWA	delivering goods (35%), while for privately owned LGVs, most vehicle kms travelled are for travelling to and from work. On average LGVs are 6.6 years old in Scotland. The vast majority of LGVs (96%) are fuelled by diesel. The sectors that are most dependent on LGVs vehicles are construction; wholesale and retail trade; accommodation and food service activities; and transportation and storage. There are around 6,025 business across Edinburgh that fall within these sectors. Below is traffic survey data obtained February 2020 for Euro VI vehicles or better (compliant vehicles); • HGVs: 76-95% Euro VI or better • Buses & coaches: 61% operators - excluding Lothian Buses Lothian Buses commitment to be 100% LEZ compliant by the end 2021. • LGV: 48% Euro VI or better (increase from 7% in 2016) It is predicted that in 2023, the number of non-compliant vehicles in Edinburgh Travel to work area will be: • ~16,000 cars • ~3610 LGV • ~120 HGV • ~120 bus By 2029 it is predicted that all vehicle types will be compliant with current LEZ emissions standards due to natural fleet turnover, furthermore, for most types this is expected to be achieved by 2025. Transport Scotland has been monitoring transport trends during the COVID-19 outbreak. This information provides a snapshot of travel across main modes. For the period 19 - 25 April 2021, compared against a pre-pandemic baseline, we saw: • Walking journeys up by 15% • Cycling journeys up by 10% • Concessionary bus journeys down by 55% • Rail journeys down by 80% • Ferry journeys down by 75% • Air journeys down by 80% • Car journeys down by 20%
Data on socio-economic	Scottish Index of Multiple Deprivation (SIMD)	Transport accessibility is lowest around the periphery of the city, for example, Niddrie,

Evidence	Available – detail source	Comments: what does the evidence tell you with regard to different groups who may be affected?
disadvantage e.g. low income, low wealth, material deprivation, area deprivation.		Baberton, Clermiston and Granton. Many of these are areas of high deprivation as ranked by the SIMD.
Data on equality outcomes	Sustrans, Bike Life, Sustrans, 2017 Transport Scotland, Transport and Travel in Scotland, 2017.	In a 2017 survey, 24.5% of school pupils, stated they normally travelled to school using only private motorised mode of travel compared with 48.8% who normally use active modes. Women were more likely than men to walk or catch the bus to work and men were more likely to cycle to work or travel by rail. In Scotland twice as many men as women cycle once or twice a week for transport. In addition, people in lower income households were more likely to walk or take the bus whereas people in higher income households were more likely to drive. 7.5% of commuters living in Edinburgh cycle to work with over 15.3 million trips made by bike in 2017. In the city black and minority ethnic (BAME) communities, women and over 65s are underrepresented when it comes to cycling.
Research / literature evidence	Yes	The Edinburgh LEZ is being progressed in close alignment with several strategies aiming to enhance placemaking and connectivity in Edinburgh, including: City Mobility Plan National Transport Strategy Strategic Transport Projects Review National Planning Framework Regional Transport Strategy Edinburgh City Vision 2050 2030 Sustainability Strategy City Plan 2030 Edinburgh City Centre Transformation
Public / patient / client experience information	An online survey (which received 2,793 responses). A series of sessions with key stakeholder including the representatives from the taxi and private hire car sectors, the bus and coach sectors, and with freight sectors though the Council's ECO Stars scheme	Findings from the consultation showed that cleaner air is important to all, but there were mixed views as to the suitability of the LEZ and to its specific aspects. General public and commercial audiences agree, albeit with differing priorities. For all however, vital questions to consider are the cost of LEZ compliance to them; the cost to life in Edinburgh (clean air, goods/services); and looking at a bigger, city and regional picture to tackle underlying issues (traffic flow, public transport, etc).

Evidence	Available – detail source	Comments: what does the evidence tell you with regard to different groups who may be affected?
	Engagement with wider general stakeholder groups (including health and environmental, and wider interest groups, community councils, and residents). Written responses from stakeholder groups and members of the public. Four stakeholder workshops (attendees including the representatives from the taxi and private hire car sectors, the bus and coach sectors, and with freight sectors though the Council's ECO Stars scheme). Engagement with 60 primary school children Engagement with neighbouring local authorities in the South East Scotland region. To provide input to this updated IIA, meetings were held in May/June 2021 with representatives from the Edinburgh Access Panel and Inclusion Scotland, as well as Officers working on the Council's Poverty Action Plan.	Worries about the financial effect on businesses and individuals were voiced. Main issues included worry about increased traffic and pollution in neighbouring streets/parks; the desire to make the area larger; and to include New Town/up to Ferry Road. Comments were mainly about considering exemptions, like motorbikes/scooters, buses/public transport, private cars, deliveries/ tradesmen
Evidence of inclusive engagement of people who use the service and involvement findings	As above	As above
Evidence of unmet need	As above	As above
Good practice guidelines	Yes	The Transport (Scotland) Act 2019 The Low Emission Zones (Scotland) Regulations 2021 National Transport Strategy (NTS) Cleaner Air for Scotland (CAFS) Strategy National Low Emissions Framework (NLEF)

Evidence	Available – detail source	Comments: what does the evidence tell you with regard to different groups who may be affected?
Carbon emissions generated / reduced data	Jacobs, Edinburgh Low Emission Zone, Revised Fleet Composition, Traffic Modelling Report, February 2021 SEPA, Air Modelling Results, March, 2021	Scottish Government is monitoring the impact of COVID 19 social distancing and lockdown actions, which includes air quality. Evidence will continue to be collected on carbon emissions/air quality by the Council and Scottish Government as lock down measures are relaxed. A series of transport modelling tests have been undertaken to assess the impact of the LEZ on travel patterns across the city. Outputs from this have been provided to SEPA to undertake supporting air quality impact analysis. Further detail can be found in the Transport Modelling Report by Jacobs and in SEPA's report on Air Modelling.
Environmental data	Scottish Government, Cleaner Air for Scotland: The Road to a Healthier Future, 2015 Public Health England, Estimating Local Mortality Burdens associated with Particulate Air Pollution, 2014. City of Edinburgh Council, Air Quality Annual Progress Report (APR) for City of Edinburgh Council, 2019 SEPA, The Clearer Air for Scotland – National Modelling Framework, Air Quality Evidence Report – Edinburgh, November 2018 City of Edinburgh Council, 2019 Air Quality Annual Progress Report (APR)	Poor outdoor air quality can result from contamination of the outdoor atmosphere by gaseous and particulate pollutants. Based on modelling, the estimated mortality burden on the population in Scotland in 2010 showed that there were around 2,000 premature deaths and a total of around 22,500 life years lost across the population which can be attributed to anthropogenic (man-made) fine particle pollution. In Edinburgh, this can be related to 205 premature deaths and 2,300 life-years lost. The Scottish Environment Protection Agency (SEPA) provided robust evidence of traffic pollution exceeding accepted levels in Edinburgh Edinburgh has five AQMAs due to NO_2 legal limit exceedances mainly due to road traffic; the sixth AQMA relates to fine particulates (PM_{10}) exceedance of the legal limit. These readings are recorded using monitoring stations around Edinburgh at different roadside placements (pavement level, lamppost, building façade etc). Road transport is primarily responsible for NO2 concentrations at the roadside. The Council's Air Quality Annual Progress Report in 2019, reported a continuing trend towards compliance with legal limits. However, exceedances remained across the city, with the Central AQMA having the highest concentration of sites that exceed legal limits.
Risk from cumulative impacts		Cumulative impacts may come about as a result of the City Mobility Plan, Edinburgh City Centre Transformation and City Plan 2030 policies which are being developed in parallel with LEZ. Cumulative impacts will likely to be positive in relation to traffic and congestion management and active travel investment under City Mobility Plan

Evidence	Available – detail source	Comments: what does the evidence tell you with regard to different groups who may be affected?
		and Edinburgh City Centre Transformation policies, and sustainable land use strategy as set out in emerging City Plan 2030. Cumulative impacts from this work will be included in due course once impact assessments of these policies/proposals have been undertaken.
Other (please specify)		
Additional evidence required		

8. In summary, what impacts were identified and which groups will they affect?

Equality, Health and Wellbeing and Human Rights	
Positive	**Affected populations**
The LEZ will discourage the most polluting vehicles from enter/exit/operating within the LEZ. This will reduce emissions and improve air quality and in turn have a positive effect on health on everyone, particularly of those most at risk of respiratory illness including older people/pensioners and children (including unborn children). This is the most significant positive impact of the LEZ and will have health and wellbeing benefits for a large population of residents, workers, and visitors to the area over a long period of time; therefore, the magnitude of the effect is substantial.	All, particularly children, pregnant women, disabled people and older people.
The LEZ is likely to encourage a modal shift from cars to public transport and active travel. This will result in air quality improvements, as well as benefitting the health of individuals from increased activity levels.	All
Reduction in vehicles within the boundary may improve access to services for those travelling by modes other than private car, including public transport or active travel	All, particularly relevant to those who are unemployed/on low income/people on benefits and those with mobility impairments who rely on public transport
Negative	
Bus operators may increase the price of bus tickets as a result of the increased costs to their operations arising from the need to replace or upgrade buses, so they are compliant with the LEZ. For some bus passengers the increase in price may make the journey unaffordable and result in them foregoing their journey. This may affect people's ability to engage in activities and access services or places of work, which in turn will affect their wellbeing/social activity. ***Mitigation:*** *This effect will not be applicable to holders of free travel passes including older people/pensioners, disabled and subsidised travel; therefore,*	Unemployed, people on benefits, single parents, homeless people, carers, part-time workers, students, young people, disabled people who rely on public transport, staff vulnerable to falling into poverty.

the effect on most of the impacted population will be mitigated. The Council will continue to engage with bus operators to determine their proposed reactions to the LEZ. If bus operators make use of funding for upgrading and retrofitting vehicles (such as the Energy Savings Trust's BEAR retrofit fund), they may not have to increase the price of tickets. The funding options available will be clearly communicated to Transport Providers.	
Bus operators may remove non-profitable routes in response to LEZ related costs to upgrade fleet. This may negatively impact those who rely on those services to engage in activities and access services or places of work, which in turn will affect their wellbeing/social activity. ***Further work/mitigation:*** *The Council will continue to engage with bus operators to determine their proposed reactions to the LEZ. If bus operators make use of funding for upgrading and retrofitting vehicles (such as the Energy Savings Trust's BEAR retrofit fund), they may not have to remove services. The funding options available will be clearly communicated to Transport Providers.*	Unemployed people, people on benefits, single parents, homeless people, carers, part-time workers, students, young people, disabled people, staff vulnerable to falling into poverty.
Non-English speaking people or people with low literacy/numeracy may experience negative impacts if they do not understand the implications of the LEZ. Impacts may affect permanent residents who don't understand the changes but it could also affect temporary overseas visitors who do not hold a British driving licence and are unable to speak English. The impact on overseas visitors is likely to be more prevalent when visitor numbers are higher for large cultural events. ***Mitigation:*** *The communications strategy will ensure that all impacted groups are reached where possible. Clear communications will be provided around LEZ implementation across different media in plain English, a range of languages as well as Braille. The Council also offers an Interpretation and Translation service, which provides interpreters and translations in different languages including British Sign Language. Equalities groups will be encouraged to disperse information on the proposals to their members.*	People with low literacy/numeracy, tourists, minority ethnic people (including non-English speakers).
People with a disability who do not use public transport or rely on carers who own a non-LEZ compliant vehicle and cannot afford to upgrade, may choose to forego their journey into the City Centre. This will potentially adversely affect their opportunity to access community and leisure facilities and have a negative impact on their social activity. ***Mitigation:*** *This impact can be mitigated through exemption for disabled tax class and Blue Badge holders. The LEZ support fund could also help disabled drivers and carers who are on means tested benefits (which includes Carer's Allowance and Disability Living Allowance) and meet the other 4 criteria to upgrade or retrofit their vehicle. Those affected could also apply for the electric vehicle loan to purchase a new or used compliant electric vehicle. Clear communications will be provided around the LEZ implementation across different media to raise awareness and ensure people have sufficient time to prepare.*	Disabled people and carers.
Minibuses providing community transport services (care providers, youth groups, school groups, elderly care providers) could be negatively impacted. Any impacts experienced by those providing care support for vulnerable people may also adversely affect those receiving care. ***Mitigation:*** *Community transport providers are eligible to claim funding from the Bus Emissions Abatement Retrofit (BEAR) programme. LGV owners can also apply for other schemes such as the Low Carbon Business Loans to purchase new electric vehicles. The Council will engage with Community*	Older people/pensioners, children, disabled people, care providers, youth groups, school groups.

Transport Providers to effectively communicate LEZ proposals and on potential impact to help them prepare for the change.	
People who use their own cars which are fitted with adaptive features (such as swivel chairs) to access community and leisure facilities within the City Centre may not be able to afford the cost of transferring the adaptive features onto LEZ compliant cars as the costs range between £500 to £30,000. This in turn potentially can adversely affect their social activity/ day to day activity. ***Mitigation:*** *Mitigated through exemption for disabled tax class and Blue Badge holders. Clear communications will be provided around the LEZ implementation across different media to raise awareness and ensure people have sufficient time to prepare. To reduce potential impacts on disabled drivers who do not qualify for a Blue Badge – consideration will be given to individual time limited exemptions from LEZ Regulations, in accordance with Section 17 of the Transport (Scotland) Act 2019, for people with disabilities not recognised by the Blue Badge Scheme, but who may be at a substantial disadvantage (under Section 20 of the Equality Act).*	Disabled people and carers.
Private Hire Vehicle and Taxi/Black cab owners on the H2S (Home to School) contract with City of Edinburgh Council to transport school children with a non-compliant LEZ vehicle may not be able to afford to upgrade their vehicle. This may impact on the H2S services offered by the Council and potentially affect school children. ***Mitigation:*** *The Council has an existing licensing regime to improve emissions standards of PHV and Taxi/Black cab which may help reduce the impact but a residual negative impact on children is possible. The Council will align this regime with the LEZ to ensure mitigation of potential impacts. Taxi owners can also make use of the funding for upgrading and retrofitting vehicles, or apply for the Switched on Taxi loan to replace their vehicle with an ultra low-emission vehicle. The funding options available will be clearly communicated to Transport Providers*	Children and disabled children
There is a potential for people who currently use their own cars to access leisure facilities for employment and recreation to be negatively impacted if they perceive there to be personal security concerns with public transport or active travel modes. As a result, passengers may forego their journey into the City Centre, particularly at night. ***Mitigation:*** *The LEZ Support fund could help these communities (if those affected are on means tested benefits and meet the other 4 criteria) to upgrade or retrofit their vehicle and provide Travel Better vouchers. Those affected could also apply for the electric vehicle loan, electric vehicle charging point grant or eBike loan (if affordable). Clear communications will be provided around the LEZ implementation across different media to raise awareness and ensure people have sufficient time to prepare.*	All, particularly minority ethnic people, disabled people, non-binary, Transgender, women, those involved in the criminal justice system, older people.
There are around 25 locations for religious congregation and places of worship that are located within the City Centre. If most of the visitors live outside of the City Centre and are reliant on cars, their activity may be adversely affected if they forego their journey. ***Mitigation:*** *The LEZ Support fund could help these communities (if those affected are on means tested benefits and meet the other 4 criteria) to upgrade or retrofit their vehicle and provide Travel better vouchers. Those affected could also apply for the electric vehicle loan, electric vehicle charging point grant or eBike loan (if affordable). Clear communications will*	People with different religious belief/ faith

be provided around the LEZ implementation across different media to raise awareness and ensure people have sufficient time to prepare.	
Users of the Travellers site and Travelling Showman sites in Edinburgh may own non-compliant vehicles and therefore will face fines when entering the LEZ. ***Mitigation:*** *This can be mitigated through exemptions as showman's vehicles are included within the national exemption of the LEZ implementation. There are no traveller sites in the boundary so access would not be impacted by the LEZ. Travelling Showman sites are sometimes situated in the city centre. To make the Travelling groups aware, targeted engagement will take place with the Travelling and Travelling showmen communities to make them aware of the proposals.*	Minority ethnic group (Travellers)
For some people it may not be financially viable to upgrade their vehicle. This may prevent people from having control of their social and work environment as well as reduce the equality of opportunity to access services (such as the Department for Work and Pensions, Citizens Advice Bureau etc) or employment opportunities. Some affected may not be in receipt of means tested benefits so would not be exempt. ***Mitigation:*** *The LEZ Support fund could help these communities (if those affected are on means tested benefits and meet the other 4 criteria) to upgrade or retrofit their vehicle and provide Travel Better vouchers. Those affected could also apply for the electric vehicle loan, electric vehicle charging point grant or eBike loan (if affordable).* *As part of the Council's Adaptation and Renewal Programs, the Wellbeing and Equalities priority includes an outcome to introduce 20 minute neighbourhoods. This would provide opportunities for people to access services, facilities and workplaces within a 20 minute walk or wheel of their homes which would reduce the need to travel by car.* *The City Mobility Plan includes a policy to review the city's bus network to improve inclusion, accessibility, integration and reduce congestion in the city centre. In addition, the ALEO reform proposals will create a single company to deliver future public transport services in Edinburgh, which would realise a number benefits for users. Improving public transport will encourage people to use it to access the services they need rather than private car.* *Clear communications will be provided around the LEZ implementation across different media to raise awareness and ensure people have sufficient time to prepare. Targeted engagement will take place with the affected communities.*	Low income households, people on benefits, unemployed, vulnerable families, older people, pensioners, low income carers, single parents and students.
Rural/semi-rural communities that require frequent access to LEZ areas (e.g. work, leisure, education) may be negatively impacted as a result of the financial implications of penalty charges or the cost of upgrade/replacement of their private vehicle. **Mitigation:** *The LEZ Support fund could help these communities (if those affected are on means tested benefits incomes and meet the other 4 criteria) to upgrade or retrofit their vehicle and provide Travel Better vouchers. Those affected could also apply for the electric vehicle loan, electric vehicle charging point grant or eBike loan (if affordable). Clear communications will be provided around the LEZ implementation across different media to raise awareness and ensure people have sufficient time to prepare.*	Rural/semi-rural communities

The Council will ensure the LEZ project aligns with the Councils strategic policies on commuting. The City Mobility Plan includes a policy to review the city's bus network to improve inclusion, accessibility, integration, and reduce congestion in the city centre. In addition, the ALEO reform proposals will create a single company to deliver future public transport services in Edinburgh, which would realise a number of benefits for users. Improving public transport will encourage people to use it to access the services they need rather than private car. In addition, measures such as introducing a Mobility as a Service system and enhancing existing or introducing new park and ride/choose facilities to enable car commuters to access low emission public transport or active modes prior to entering a LEZ will assist.	
Those who lease cars using the Motability scheme may find that their lease does not expire until after the LEZ scheme is implemented and their vehicle is not compliant. ***Mitigation****: The Council has engaged with the Motability scheme provider to establish the age of the vehicles for lease. The scheme provider confirmed that the majority of vehicles for lease are new or nearly new (the oldest vehicles are 5 years old) which means that all vehicles would be compliant with LEZ standards.*	Disabled people
The LEZ may result in the displacement of traffic to areas surrounding the boundary. The Edinburgh assessment work shows that there is potential for localised impact on some boundary streets e.g. Palmerston Place and Chester Street. Traffic on these streets would increase and the proportion of non-complaint vehicles would also increase. In turn this may result in increased traffic and a reduction of air quality of those areas which could impact those living on the boundary streets. Modelling analysis indicates that in the long-term (future scenario) the impact on Palmerston Place and Chester Street is not sustained. This is likely to be due to less non-compliant traffic needing to use the diverted route, as well as vehicle standards generally improving. ***Mitigation:*** *To reduce the impact of traffic displacement on the boundary streets, mitigation measures are being developed through the network management strategy and will include measures such as junction improvements, road changes, optimised signal and improved signing. These will be reviewed regularly to ensure LEZ demand is accommodated. Monitoring of air quality has been increased in the predicted worse affected areas and further consideration will be given to future monitoring as the Scheme decision is progressed.*	All, particularly those living on the boundary streets suffering from chronic respiratory illness and young children

Environment and Sustainability including climate change emissions and impacts	
Positive	**Affected populations**
Implementing LEZ will improve vehicle standards which in turn will bring air quality improvements and health & wellbeing improvements, particularly those population groups which are most sensitive to poor air quality such as those suffering from chronic respiratory illness and young children.	All, particularly those suffering from chronic respiratory illness and young children.

Interventions that reduce local air pollution are also likely generate a positive effect on reducing factors contributing to climate change through reduced greenhouse gas emissions.	All
LEZ is likely to promote sustainable forms of transport via modal shift from cars to buses, shared cars, bicycles or walking, which in turn will have a positive impact on air quality. This may also have a positive effect on the health and well-being of people due to physical activity (cycling/walking) and exposure to outdoor spaces.	All
Quieter (alternatively fuelled) vehicles and reduced traffic flows caused by modal shift towards public transport and active travel, are likely to lead to a reduction in inner-city background noise. Lower noise pollution is anticipated to have health and productivity benefits.	All
There are potential benefits from a reduction in air pollution deposition on habitats through reduced traffic.	All
Fewer vehicular trips into urban areas covered by a LEZ and increases in the use of sustainable modes should provide opportunities to improve the quality of public spaces/public realm for non-car users.	All
Negative	
The LEZ may result in the displacement of traffic to areas surrounding the boundary. The Edinburgh assessment work shows that there is potential for localised impact on some boundary streets e.g. Palmerston Place and Chester Street. Traffic on these streets would increase and the proportion of non-complaint vehicles would also increase. In turn this may result in increased traffic and a reduction of air quality of those areas. Modelling analysis indicates that in the long-term (future scenario) the impact on Palmerston Place and Chester Street is not sustained. This is likely to be due to less non-compliant traffic needing to use the diverted route, as well as vehicle standards generally improving. ***Mitigation:*** *To reduce the impact of traffic displacement on the boundary streets, mitigation measures are being developed through the network management strategy and will include measures such as junction improvements, road changes, optimised signal and improved signing. These will be reviewed regularly to ensure LEZ demand is accommodated. Monitoring of air quality has been increased in the predicted worse affected areas and further consideration will be given to future monitoring as the Scheme decision is progressed.*	All, particularly those living on the boundary streets suffering from chronic respiratory illness and young children
A shift towards compliant vehicles would lead to redundant non-compliant vehicles being removed from the fleet. The scrappage of these surplus vehicles may cause environmental harm if not disposed of correctly (e.g. battery disposal). ***Mitigation:*** *Consult with local waste management facilities in addition to relevant stakeholders (e.g. Zero Waste Scotland) regarding waste management strategies to ensure vehicle components are disposed/recycled sustainably that minimise environmental impact.*	All

Economic including socio-economic disadvantage	
Positive	**Affected populations**
Increased economic activity for a number of sectors: second hand car traders, vehicle scrappage, vehicle leasing operators, active-travel distributors/repairers, and public transport operators through increased patronage.	Business communities, staff
Decreased traffic and cleaner atmosphere in the city may lead to higher quality of public spaces in the city. This could lead to more opportunities for businesses as more people are attracted to the city/city centre due to less polluted area becoming more attractive.	Business communities, staff
The development of the retrofitting and Low Emission Vehicle (LEV) industries as a result of the LEZ may create employment opportunities throughout the supply chain. Jobs involving the manufacture, maintenance, and sales/operation of lease or rental vehicles should be created.	Business communities, staff
A reduction in inner-city congestion will impact the efficiency of the public transport network. Reduced congestion should lessen delays, lower the time taken for public transport (i.e. buses) to complete their routes, and improving the efficiency of travel for both commuters and leisure seekers and encouraging mode shift.	All
Potential benefit to restaurants/cafes within LEZ areas due to improvements in air quality may encourage increase patronage.	Business communities, staff
Improved air quality may make areas within LEZs more pleasant places to work particularly for those working outdoors (e.g. market traders, street cleaners etc) including staff of restaurants/cafes with outdoor seating areas.	Business communities, staff
Negative	
Decreased access to the city centre due to the LEZ vehicle standards may cause certain members of society (lower income households) to be dissuaded from applying for a job in the city. This will have a negative effect on the size and diversity of the potential workforce in Edinburgh. ***Mitigation****: The LEZ Support fund could help these communities (if those affected are on means tested benefits and meet the other 4 criteria) to upgrade or retrofit their vehicle and provide Travel Better vouchers. Those affected could also apply for the electric vehicle loan, electric vehicle charging point grant or eBike loan (if affordable). Clear communications will be provided around the LEZ implementation across different media to raise awareness and ensure people have sufficient time to prepare. Wider Council policies on parking are designed to dissuade people from parking in the City Centre and use more sustainable modes of transport.*	Unemployed, people on benefits, single parents, homeless people, carers, part-time workers, students, young people, disabled people, staff vulnerable to falling into poverty.
Vehicle users, especially LGV, bus, and HGV, have relatively long turnover periods, requiring users to change earlier than anticipated. The need to purchase compliant vehicles and sell/scrap their non-compliant vehicle means that the users will incur additional financial cost. ***Mitigation:*** *Businesses can make use of schemes such LEZ Support Fund to dispose of non-compliant vehicles, the Low Emission Retrofit Fund to upgrade their existing vehicles, or the Low Carbon Transport Business Loan*	Business communities

to purchase electric vehicles. CEC will engage with Businesses to effectively communicate LEZ proposals and on potential impact to help them prepare for the change.	
Small and medium sized enterprises who rely on LGVs to deliver goods or drive to clients to provide a service could be disproportionately affected due to the level of non-compliance (non-compliance rates are 48%) and the economic impacts associated with the commercial-type vehicles sector. This may negatively impact business owners, particularly small enterprises which represent over 90% of business in Edinburgh. ***Mitigation:*** *Businesses can make use of schemes such LEZ Support Fund to dispose of non-compliant vehicles, the Low Emission Retrofit Fund to upgrade their existing vehicles, or the Low Carbon Transport Business Loan to purchase electric vehicles. CEC will engage with Businesses to effectively communicate LEZ proposals and on potential impact to help them prepare for the change.*	Business communities

9. Is any part of this policy/ service to be carried out wholly or partly by contractors and if so how will equality, human rights including children's rights, environmental and sustainability issues be addressed?

Where contractors are used, as part of the Council's procurement process due regard is required to be given to all equalities and right, environmental and sustainability impacts when undertaking work on behalf of the Council.

10. Consider how you will communicate information about this policy/ service change to children and young people and those affected by sensory impairment, speech impairment, low level literacy or numeracy, learning difficulties or English as a second language? Please provide a summary of the communications plan.

A range of communication tools will be used to reach out to all types of people regardless of their age, disability or language etc. Direct communication will be undertaken with stakeholders in the form of written communication, meetings, workshops and messages will be issued through the Council's social media channels. We will contact equalities organisations to distribute information to members. Formats will be designed to be understood by a range of population groups.

11. Is the policy likely to result in significant environmental effects, either positive or negative? If yes, it is likely that a Strategic Environmental Assessment (SEA) will be required and the impacts identified in the IIA should be included in this.

Strategic Environmental Assessment screening in 2019 highlighted the need for the LEZ to be assessed as a part of the wider Edinburgh City Centre Transformation programme and City Mobility Plan work. The SEA concluded that the cumulative impacts of introducing the LEZ along with other policies and strategies, such as the City Mobility Plan and Edinburgh City Centre Transformation, would generally be positive.

12. Additional Information and Evidence Required

If further evidence is required, please note how it will be gathered. If appropriate, mark this report as interim and submit updated final report once further evidence has been gathered.

13. Specific to this IIA only, what recommended actions have been, or will be, undertaken and by when? (these should be drawn from 7 – 11 above) Please complete:

Specific actions (as a result of the IIA which may include financial implications, mitigating actions and risks of cumulative impacts)	Who will take them forward (name and job title	Deadline for progressing	Review date
Continue to engage with bus operators to determine their proposed reactions to the LEZ.	George King, Transport Officer	ongoing	June 2021
Develop a communications strategy to ensure that all impacted groups are reached where possible	George King, Transport Officer	ongoing	June 2021
Provide clear communications around the LEZ implementation across different media to raise awareness and ensure people have sufficient time to prepare.	George King, Transport Officer	ongoing	June 2021
Engage with Community Transport Providers to effectively communicate LEZ proposals and on potential impact to help them prepare for the change.	George King, Transport Officer	ongoing	June 2021
Consideration will be given to individual time limited exemptions from LEZ Regulations, in accordance with Section 17 of the Transport (Scotland) Act 2019, for people with disabilities not recognised by the Blue Badge Scheme, but who may be at a substantial disadvantage (under Section 20 of the Equality Act).	George King, Transport Officer	ongoing	September 2021
Communicate clearly the funding options available to Transport Providers. This is also a national action for Transport Scotland.	George King, Transport Officer	ongoing	September 2021
Targeted engagement will take place with affected communities/population groups.	George King, Transport Officer	ongoing	September 2021
Ensure appropriate mitigation measures are implemented and monitored, to reduce the impact of traffic displacement on the boundary streets	George King, Transport Officer	ongoing	June 2021
Consult with local waste management facilities in addition to relevant stakeholders (e.g. Zero Waste Scotland) regarding waste management strategies to ensure vehicle components are disposed/recycled sustainably that minimise environmental impact.	George King, Transport Officer	ongoing	September 2021

14. Are there any negative impacts in section 8 for which there are no identified mitigating actions?

No

15. How will you monitor how this proposal affects different groups, including people with protected characteristics?

A period of statutory engagement and consultation will commence following the Committee meeting to make stakeholders and the public aware of the detail of the Preferred LEZ Scheme and to obtain views on the proposal. This will include engagement with the affected groups, as well as an online public consultation survey. During the engagement process, questions on equalities will form part of the consultation to obtain views and to ensure a representative sample of the impacted populations has been reached.

While working with Transport Scotland and the Energy Savings Trust, the Council will continue to monitor the uptake of LEZ Support Funds and other related retrofit funds.

16. Sign off by Head of Service/ NHS Project Lead

Name - Gareth Barwell

Date - 10th June 2021

17. Publication

Completed and signed IIAs should be sent to strategyandbusinessplanning@edinburgh.gov.uk to be published on the IIA directory on the Council website www.edinburgh.gov.uk/impactassessments