

Norfolk ZEBRA Scheme

Strategic Case


January 2022

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First  **Eastern Counties**



Transport
for Norwich



Norfolk County Council



STRATEGIC CASE

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Picture's courtesy of Visit Norwich





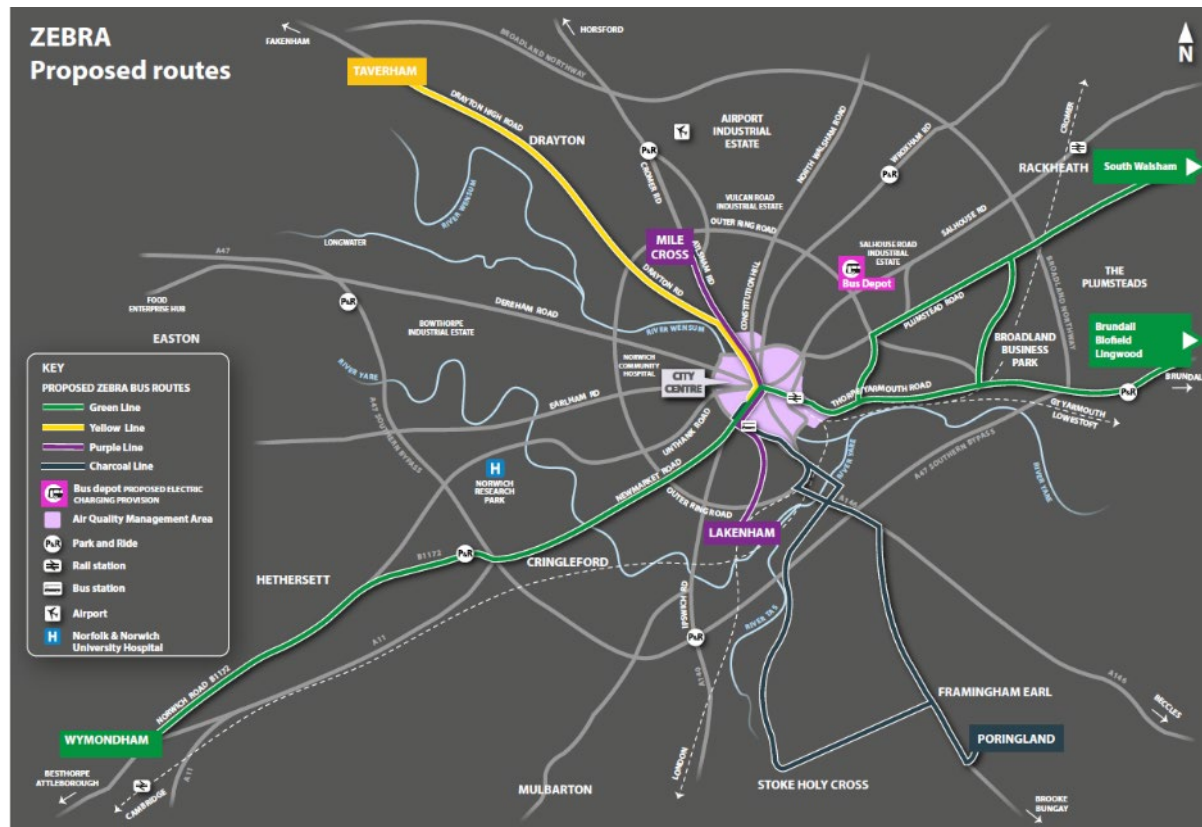
1 Overview

1.1.1 This Strategic Case outlines why government investment in Norwich and this Zero Emission Bus Regional Area (ZEBRA) proposal is required, identifying the problems which exist related to poor air quality and carbon-generating diesel buses. It describes the bus market and characteristics of the bus network, bus service levels in Norwich and why First Bus were selected as our partner. It sets out the case for change and demonstrates how the Norfolk ZEBRA proposal achieves the objectives of the ZEBRA scheme, provides strategic fit with Government and Department for Transport (DfT) priorities, as well as other projects, programmes and initiatives being pursued by Norfolk County Council (NCC), local bus operators and stakeholders, particularly our new Norfolk Bus Service Improvement Plan, which clearly sets out our joint aspiration to transition to a zero emission bus fleet. It also describes how the proposals were developed and which options were considered. In summary, the Norfolk ZEBRA proposal is based around the following:

- 15 new, battery-powered, single-decker electric buses replacing 15 Euro 3 diesel-powered buses operated commercially by First Bus. The new vehicles will operate on 4 existing bus routes, all of which operate through the Low Emission Zone (LEZ) and Air Quality Management Area (AQMA) in Norwich City Centre,
- Electrical upgrade to the First Bus depot, including vehicle charging infrastructure at the depot (no charging infrastructure outside of the depot is required),
- DfT investment of £3,265,083 is sought. First Bus investment is £3,623,361. Total cost of proposal is **£6,888,444**.



FIGURE 1: ZEBRA ROUTES IN NORWICH



2 Defining the Place – Overview of Norwich

2.1 Location

- 2.1.1 Norwich is located in the east of England, 100 miles north of London and 60 miles north-east of Cambridge - **Figure 2**.
- 2.1.2 Norwich is the largest city in East Anglia with a population estimated in the Norwich City Council local authority area of 143,135 in 2019 and a population in the Greater Norwich area, which includes areas covered by South Norfolk and Broadland District Councils, of 213,166.
- 2.1.3 Norwich is the most complete medieval city in the United Kingdom, becoming a city in 1094. It has preserved a lot of its medieval past with cobbled streets of Elm Hill, Timber Hill and Tombland. It has several ancient buildings at the heart of the city, such as Norwich Cathedral, St Andrew's Hall, half-timbered

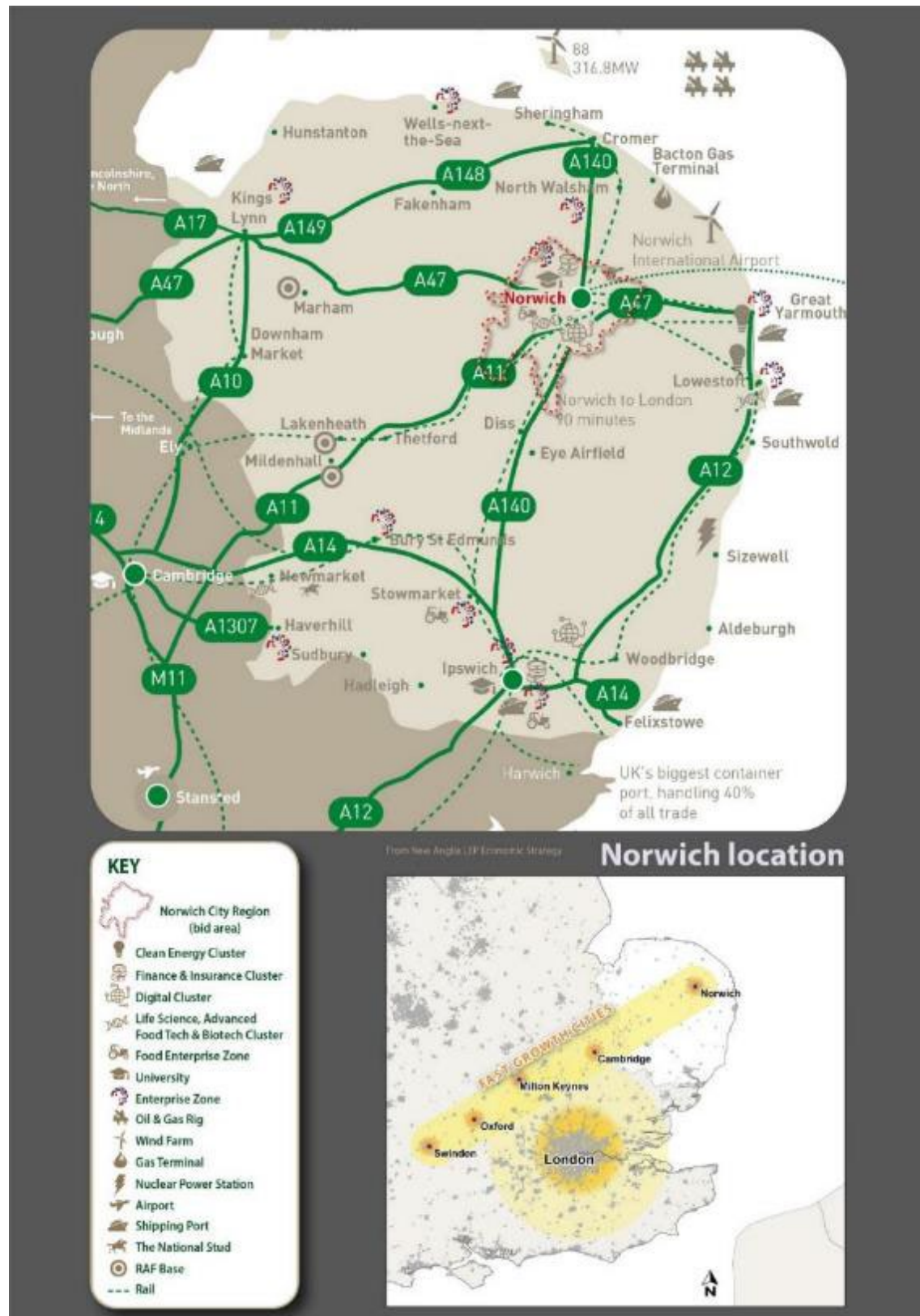


houses such as Dragon Hall, The Guildhall and Strangers' Hall, many medieval lanes and Norwich Castle, which sits as the hub, proudly high on its own mound.

- 2.1.4 In May 2012, Norwich was designated England's first UNESCO City of Literature. As one of the UK's most popular tourist destinations, it was voted by 'The Guardian' newspaper in 2016 as the "happiest city to work in the UK" and in 2013 as one of the best small cities in the world by The Times Good University Guide. Norwich was voted one of the "Best Places to Live" in the UK by 'The Sunday Times' newspaper in three consecutive years from 2018 to 2020.

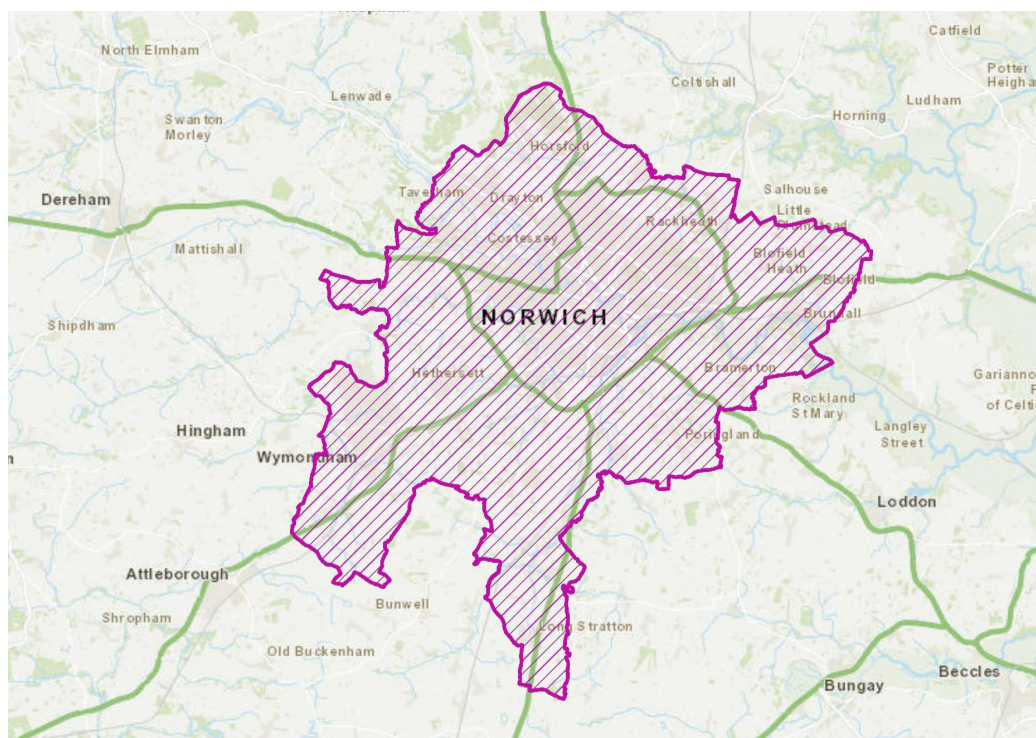


FIGURE 2: NORWICH LOCATION



- 2.1.1.5 The Greater Norwich Region (GNR), shown in **Figure 3**, is the defined area for the investment being sought and covers the whole urban area of Norwich, the Broadland Growth Triangle (the UK's largest urban extension delivering circa 13,500 homes and 2,600 jobs) and the satellite settlements of Wymondham and Hethersett. It comprises the whole of Norwich City Council's area and part of Broadland District Council and South Norfolk Council areas

FIGURE 3: DEFINED AREA



2.2 Employment

- 2.2.1 Major employment centres are located within the city centre, Broadland Growth Triangle, the Airport Industrial Estate and the Norwich Research Park (NRP) Enterprise Zone. The GNR is key to the region's economy with considerable potential for growth in world-class, high-value, knowledge-intensive jobs. For example, the NRP, which encompasses the University of East Anglia (UEA), the Norfolk and Norwich University Hospital (NNUH) and



the John Innes Centre, is recognised as Europe's largest site for research in food, health and life sciences; hosting over 80 businesses and 12,000 employees, including 3,000 scientists and over 50 innovation science and IT-based businesses.

- 2.2.2 Most sectors identified by the New Anglia Local Enterprise Partnership (LEP) as having high growth potential have a strong presence in the GNR.
- 2.2.3 The A11 is a major focus of growth providing key strategic access to London, Cambridge and much of the rest of the UK, and forms the basis of the Norwich to Cambridge 'Tech Corridor'. The 'Tech Corridor' has the potential to enable 26,000 additional jobs and create additional economic value of £2.75bn in real terms. Growth along this corridor since 2010 has exceeded national and regional averages.
- 2.2.4 Major housing and employment growth is planned within the GNR and this will increase the need to travel across the area. The Joint Core Strategy (JCS) for Greater Norwich plans for 37,000 additional dwellings across the wider Norwich area by 2026.
- 2.2.5 Within the GNR, recent improvements have seen the construction of the A1270 Broadland Northway (formerly referred to as the Norwich Northern Distributor Road), providing a high-quality dual carriageway route to the north of Norwich. This road has taken traffic out of the city centre and the northern and eastern suburbs, allowing reallocation of road space to bus priority, cycling and walking.
- 2.2.6 According to the INRIX 2021 Traffic Scorecard Report, Norwich was classified as the 37th most congested of 111 large UK urban areas and was the 260th most congested city in the world in 2021. Each driver lost an average of 38 hours in congestion over the course of the year, equating to an annual cost per driver of around £225.



3 Defining the Place – The Customer Base

3.1 Demographics

3.1.1 The work-day population of the city region was over 280,000 according to the 2011 Census, the most recent data available. However, population growth since 2011 means that the figure will now exceed 300,000.

3.1.2 The age structure of the population within the GNR based on the 2011 census reveals that Norwich has a comparably higher percentage of population (21.8%) within the 20 to 29 age band, highlighting its 'student city' character with various centres of academic excellence. We know from bus user surveys conducted in Norwich and Norfolk by Transport Focus in 2017/18 that over 60% of those aged 16-34 who were surveyed travelling on a bus used the bus at least 5 days per week, highlighting the large number of younger people relying on bus travel in Norwich.

3.1.3 Outside of Norwich, there is an ageing population, particularly in the neighbouring local authorities. We know from the 2017/18 Transport Focus survey in Norwich and Norfolk that a third (33%) of those aged over 60 travel on the bus at least once or twice a week, highlighting a reliance on bus travel for this increasing sector of the population.

3.1.4 Across Greater Norwich, an average of 19% of people have a long-term health condition or disability, which places considerable strain on health and supporting networks. The 2017/18 Transport Focus survey in Norwich showed that 68% of those with a disability travel on the bus at least 3 or 4 days a week.

3.2 How people travel

3.2.1 Prior to the COVID pandemic, bus patronage in Norwich was increasing, with First Bus reporting annual increases on most services and konectbus also reporting growth within the GNR, bucking the national trend. The impact of



the COVID pandemic has led to a significant shift in the level of public sector support for buses in the county, but passengers are now returning to most services and the trajectory suggests that we can be back at 2019 levels of patronage and revenue within the next year or so. In November 2021, bus patronage was reported to be at 70-80% of 2019 levels.

- 3.2.2 Footfall data is collected by the Norwich Business Improvement District (BID). Prior to COVID, this indicated that footfall levels were stable, with around 9.5m pedestrian movements per annum through the main pedestrianised street in Norwich. In 2020, this figure dropped to around 5.7m movements. The latest figures from 2021 indicate that visitor numbers to Norwich have been maintained and are comparable with pre-COVID, whilst the number of employees in the city remains lower.
- 3.2.3 The number of households with no cars or vans is lower in Broadland and South Norfolk than the regional and national averages (11.4% and 11.7% against 18.5% and 25.8% respectively). In contrast, levels of households without cars or vans are distinctly higher in Norwich compared to both the regional and national levels (33.4% against 18.5% and 25.8% respectively). We know from the 2017/18 Transport Focus survey in Norwich and Norfolk that 84% of those with no access to a car use the bus at least 3-4 times per week, highlighting the reliance on bus for these individuals.
- 3.2.4 Nearly 70% of all commuting trips in Norwich are less than 10km in length. This compares with 47% in the rest of Norfolk and 44% for the East of England. This highlights the opportunity for these trips to be undertaken sustainably by public transport, walking or cycling.
- 3.2.5 In terms of modal share outlined in the 2011 census, only 46% of people travel to work by car in Norwich, compared to 64% for Norfolk and 62% for the East of England, highlighting the strong bus patronage levels seen pre-COVID.



4 Defining the Place – Bus Network

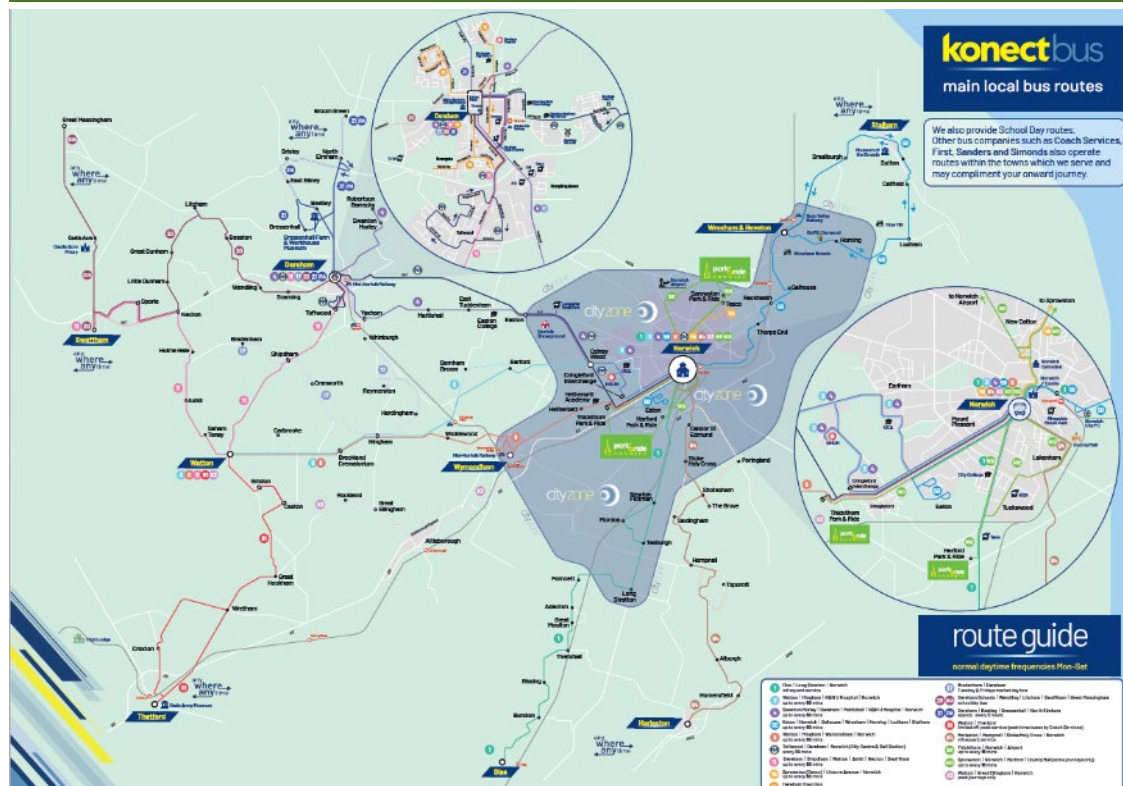
- 4.1.1 Partnership working is at the heart of how bus services are delivered in Norwich and Norfolk. Bus operators and local authorities have worked tirelessly in recent years to engender a positive and can-do working relationship, an approach that has seen the county's bus passengers benefit from a relatively stable bus network, a stable level of funding from NCC to support socially, necessary bus services and fares initiatives designed to entice people to use the bus more.
- 4.1.2 The public transport bus network in Norwich radiates out from the historic city centre in a hub and spoke arrangement, which has been in place for the last 20+ years and is the basis on which the current bus network has been developed. Some corridors are more developed than others in terms of the provision of bus priority and all have different socio-economic characteristics related to deprivation, employment, education, demographics, as well as travel behaviours and network usage.
- 4.1.3 First Bus operates the main Norwich network, on a cross-city corridor basis, with corridors extending out to some of the larger market towns and to Great Yarmouth and King's Lynn. Within the GNR, First Bus has the largest market share in terms of the number of stop departures (85%) and number of services (52%). Within the city centre area, frequencies of bus service are generally every 10-20 minutes, providing links to key employment centres, NNUH, UEA, high schools and colleges, and shopping / leisure facilities in the city centre and on the outskirts. Bus networks for First Bus and konectbus are presented in **Figure 4** and **Figure 5**.



FIGURE 4: BUS NETWORK OF FIRST BUS



FIGURE 5: BUS NETWORK OF KONECTBUS



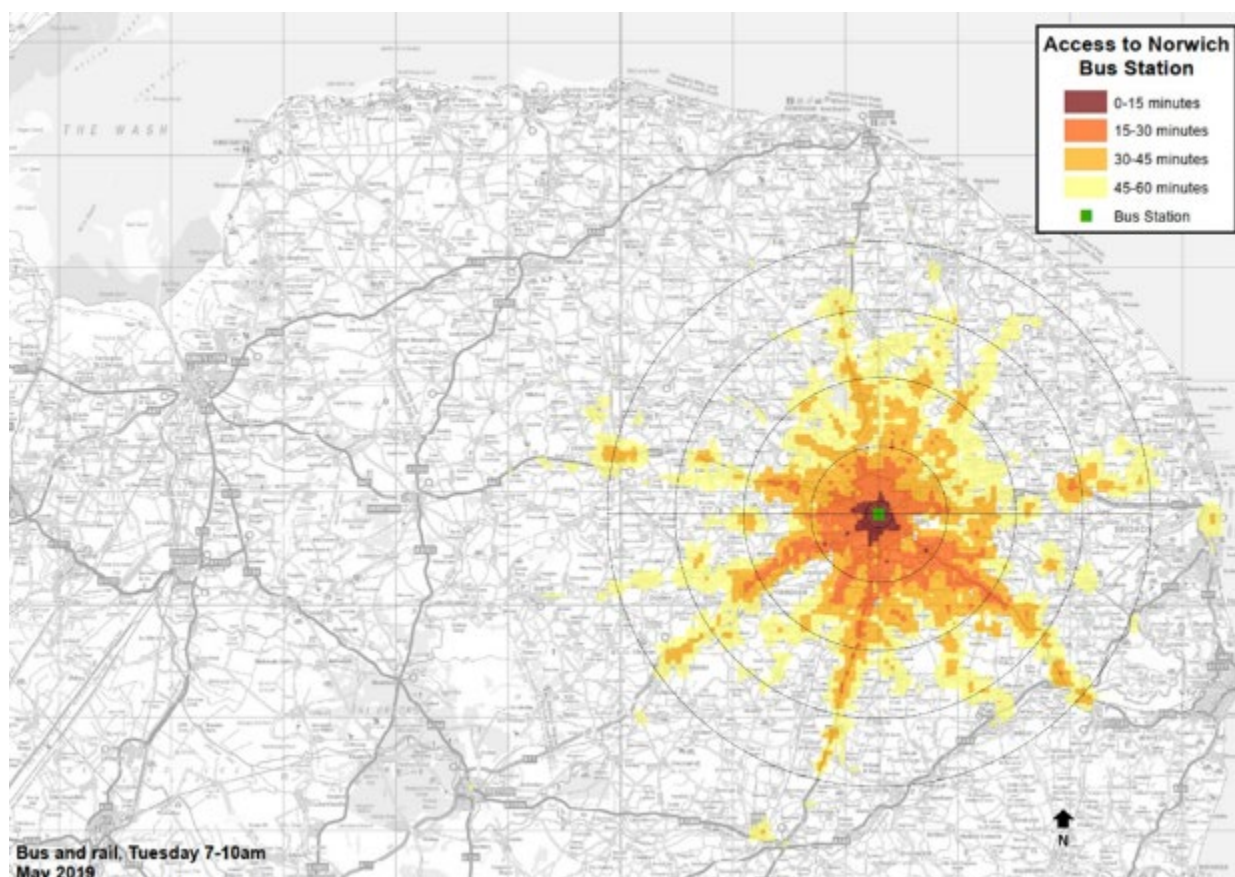


- 4.1.4 Bus services in Norwich are supplemented by a small number of other operators who come into the city from the nearest market towns and rural areas. These services are principally provided by konectbus, Sanders Coaches and Simonds.
- 4.1.5 Norwich has a Park & Ride network operated commercially by konectbus. Five sites are provided with dedicated connecting services operating into the city centre Monday-Saturday. A sixth site, Costessey, sited in the west near Longwater, operates dedicated services to the NNUH and UEA sites. The Thickthorn Park & Ride site to the south of Norwich, located on the busiest trunk road into Norwich, the A11, also has evening and Sunday services.
- 4.1.6 Pre-COVID, there were around 45,000 passengers per day travelling on the bus network in the GNR. Sustained bus patronage increases had been seen pre-COVID, bucking the national trend, with First Bus reporting annual growth of 5-10% across their services in the 5-year period up to COVID, and konectbus also reporting growth on their city services over the same period.
- 4.1.7 Around 65% of the buses operating in the GNR are double-decker vehicles, with the majority being Euro 5 and Euro 6 (69%) compliant in terms of emissions. However, there remain 22% of vehicles being Euro 3 compliant. There are currently no zero emission buses in operation.
- 4.1.8 NCC currently spends £3.2m per annum on tendered services and, despite severe funding cuts for other services, Norfolk's councillors have always seen the benefit of our subsidised public transport services and have not made any cuts to this budget for the last 10 years. In addition to this £3.2m, we also give grants totalling £500k per annum to community transport operators for dial-a-ride and voluntary car services, which help to supplement the tendered services.



- 4.1.9 Accessibility of the city centre by public transport in the morning peak is generally good. **Figure 6** shows accessibility of the city centre on a weekday with a maximum journey length of 60mins.

FIGURE 6: 60-MINUTE PUBLIC TRANSPORT ACCESSIBILITY TO NORWICH CITY CENTRE



- 4.1.10 There are different metrics that can be used to define market share for all bus operators operating within the defined area. We have looked at the following, which is summarised in **Table 1**.

- Number of stop departures for each bus operator on a weekday in the GNR,
- Number of services operated in the GNR,
- Number of services that operated outside GNR (Please note: many of the services also operate within the GNR).



TABLE 1: MARKET SHARE BASED ON STOP DEPARTURES AND NUMBER OF SERVICES OPERATING WITHIN THE GNR AND OUTSIDE

Bus Operator	No. of stop departures in GNR	Stop departures %	No. of services in GNR	GNR %	No of services outside GNR	Outside GNR %
First	REDACTED	REDACTED	REDACTED	REDACTED	REDACTED	REDACTED
konectbus	REDACTED	REDACTED	REDACTED	REDACTED	REDACTED	REDACTED
Sanders Coaches	REDACTED	REDACTED	REDACTED	REDACTED	REDACTED	REDACTED
Semmence	REDACTED	REDACTED	REDACTED	REDACTED	REDACTED	REDACTED
Our Bus	REDACTED	REDACTED	REDACTED	REDACTED	REDACTED	REDACTED
Borderbus	REDACTED	REDACTED	REDACTED	REDACTED	REDACTED	REDACTED
Simonds Coaches	REDACTED	REDACTED	REDACTED	REDACTED	REDACTED	REDACTED
Coach Services	REDACTED	REDACTED	REDACTED	REDACTED	REDACTED	REDACTED
Completely Business	REDACTED	REDACTED	REDACTED	REDACTED	REDACTED	REDACTED
Lynxbus	REDACTED	REDACTED	REDACTED	REDACTED	REDACTED	REDACTED
Our Bus	REDACTED	REDACTED	REDACTED	REDACTED	REDACTED	REDACTED
West Norfolk Community Transport	REDACTED	REDACTED	REDACTED	REDACTED	REDACTED	REDACTED
TOTAL	46,964	100	94	100	236	100

4.1.11 Information on fleet sizes, vehicle composition (single / double decker) and Euro engine specification is outlined in **Table 2** and **Table 3** below.

4.1.12 **Table 4** illustrates the number of buses that would be emission compliant if the funding was successful.



TABLE 2: FLEET SIZE AND VEHICLE COMPOSITION OF BUSES IN DEFINED AREA

Bus Operator	No. of vehicles	Number of single decker vehicles	Number of double decker vehicles
First	REDACTED	REDACTED	REDACTED
konectbus	REDACTED	REDACTED	REDACTED
Sanders Coaches	REDACTED	REDACTED	REDACTED
Semmence	REDACTED	REDACTED	REDACTED
Our Bus	REDACTED	REDACTED	REDACTED
Simonds Coaches	REDACTED	REDACTED	REDACTED
Coach Services	REDACTED	REDACTED	REDACTED
Borderbus	REDACTED	REDACTED	REDACTED
TOTAL	268	95	173

TABLE 3: EURO STANDARD OF BUSES IN DEFINED AREA

Bus Operator	Number of Euro 3 Vehicles	Number of Euro 4 Vehicles	Number of Euro 5 Vehicles	Number of Euro 6 Vehicles	Number of Zero Emission Vehicles
First	REDACTED	REDACTED	REDACTED	REDACTED	REDACTED
konectbus	REDACTED	REDACTED	REDACTED	REDACTED	REDACTED
Sanders Coaches	REDACTED	REDACTED	REDACTED	REDACTED	REDACTED
Semmence	REDACTED	REDACTED	REDACTED	REDACTED	REDACTED
Our Bus	REDACTED	REDACTED	REDACTED	REDACTED	REDACTED
Simonds Coaches	REDACTED	REDACTED	REDACTED	REDACTED	REDACTED
Coach Services	REDACTED	REDACTED	REDACTED	REDACTED	REDACTED
Borderbus	REDACTED	REDACTED	REDACTED	REDACTED	REDACTED
TOTAL	59	24	132	53	0



TABLE 4: EURO COMPLIANCY (EURO 5 AND ABOVE)

Bus Operator	Number of Euro 4 and below Vehicles (After Feb 2024)	Number of Euro 5 and above Vehicles	Number of Zero Emission Vehicles (After Feb 2024)
First	REDACTED	REDACTED	15
konectbus	REDACTED	REDACTED	REDACTED
Sanders Coaches	REDACTED	REDACTED	REDACTED
Semmence	REDACTED	REDACTED	REDACTED
Our Bus	REDACTED	REDACTED	REDACTED
Simonds Coaches	REDACTED	REDACTED	REDACTED
Coach Services	REDACTED	REDACTED	REDACTED
Borderbus	REDACTED	REDACTED	REDACTED
TOTAL	68	185	15

4.1.13 A Voluntary Quality Partnership (VQP) is already in place ('the Norwich Bus Charter') across Greater Norwich, which is a voluntary agreement between NCC, Norwich City Council and the main Norwich area bus operators. The aim of the 'Norwich Bus Charter' is to clearly outline to bus users what they can expect in terms of a minimum level of service related to fares, bus stop facilities, safety, accessibility, complaints, service performance and travel information. This has provided a strong foundation for partnership working on joint initiatives such as:

- **Multi-operator and multi-modal ticketing:** the 'Fusion' and 'PlusBus' tickets are available across Greater Norwich,
- **Punctuality Improvement Partnerships (PIPs):** these are in place between the County Council and bus operators, with quarterly meetings arranged to review performance and discuss improvement measures. This has stabilised bus performance and has assisted in identifying areas where investment in bus priority measures is



currently being delivered through the Transforming Cities Fund programme,

- **Engine switch-off initiatives:** Bus operators and local authorities worked together on the implementation of an engine switch-off policy within the Air Quality Management Area (AQMA) in Norwich city centre, which has helped to reduce the level of NO₂ concentrations,
- **Successful joint applications for funding:** This saw £416k funding secured from DEFRA in 2015 for 24 of the worst polluting vehicles being retro-fitted with emission-reducing exhaust technology.

- 4.1.14 The Norfolk Bus Service Improvement Plan (BSIP) sets out that the 'Norwich Bus Charter' will form the basis of a new county-wide Customer Charter that will provide a cornerstone of a significant marketing campaign to encourage people onto the bus. The Customer Charter will provide a comprehensive set of expectations that passengers should have when using buses in Norfolk, based on the best-in-class standards available in the industry. The Enhanced Partnership structure, set out in the new National Bus Strategy, will form the basis of delivering the priorities set out in the Norfolk BSIP.
- 4.1.15 There are over 100 electronic information displays provided at bus stops, transport interchanges and Park & Ride sites across Greater Norwich, providing live and scheduled public transport information, as well as wider information, such as that promoting engine switch-off and promotions to attract greater use of buses.

5 Case for intervention

5.1 Strategic context

- 5.1.1 The defined area for this proposal is the GNR, **Figure 3**, as this is the area of worst air quality in Norfolk, where the largest number of buses operate and where First Bus is the dominant bus operator. Congestion and a reliance on fossil fuels causes poor air quality, with the city centre designated an AQMA.



- 5.1.2 High deprivation, lower than regional and national averages for gross weekly earnings, employment and educational attainment, low levels of car ownership and poor transport connectivity in this area support the governments “Levelling Up” agenda.
- 5.1.3 The bus routes that will benefit from new zero emission buses operate through areas of high multiple deprivation and link these areas with appropriate employment, training and education at edge of city industrial estates, business parks and the city centre itself.
- 5.1.4 The commitment to transition to zero emission buses is a key element of the Norfolk BSIP and the Enhanced Partnership model adopted in Norfolk will be able to deliver, at pace, on this commitment, as well as introduce complementary elements related to affordable and simple fares, improved reliability and upgraded on-board facilities.

5.2 Grow and level up the economy

- 5.2.1 The principle of ‘Levelling Up’ was announced at the 2020 Spending Review to support communities to bring economic benefits and help bind communities together. This approach prioritises investment in regeneration and growth in places of lower productivity and connectivity. Funding to support the ‘Levelling Up’ agenda will come through a wide range of different funding opportunities, with the government committed to transforming bus and cycle infrastructure to strengthen the spine of connectivity across the country. Norwich sits within Category 2 of the ‘Levelling Up’ categories and while this reflects that Norwich hasn’t been identified as a place of highest need (ie. Category 1), the case for intervention is outlined in this section based on the need to address poor transport connectivity for public transport, provide higher-quality bus travel between areas of high deprivation and lower skilled jobs and training, and improve air quality in areas that are congested and where reliance on bus travel is highest. Other assessment criteria considered by government in terms of support through ‘Levelling Up’ are



deliverability, strategic fit with local and government priorities and value for money. The Norfolk ZEBRA proposal is demonstrated to strongly support these criteria throughout this business case.

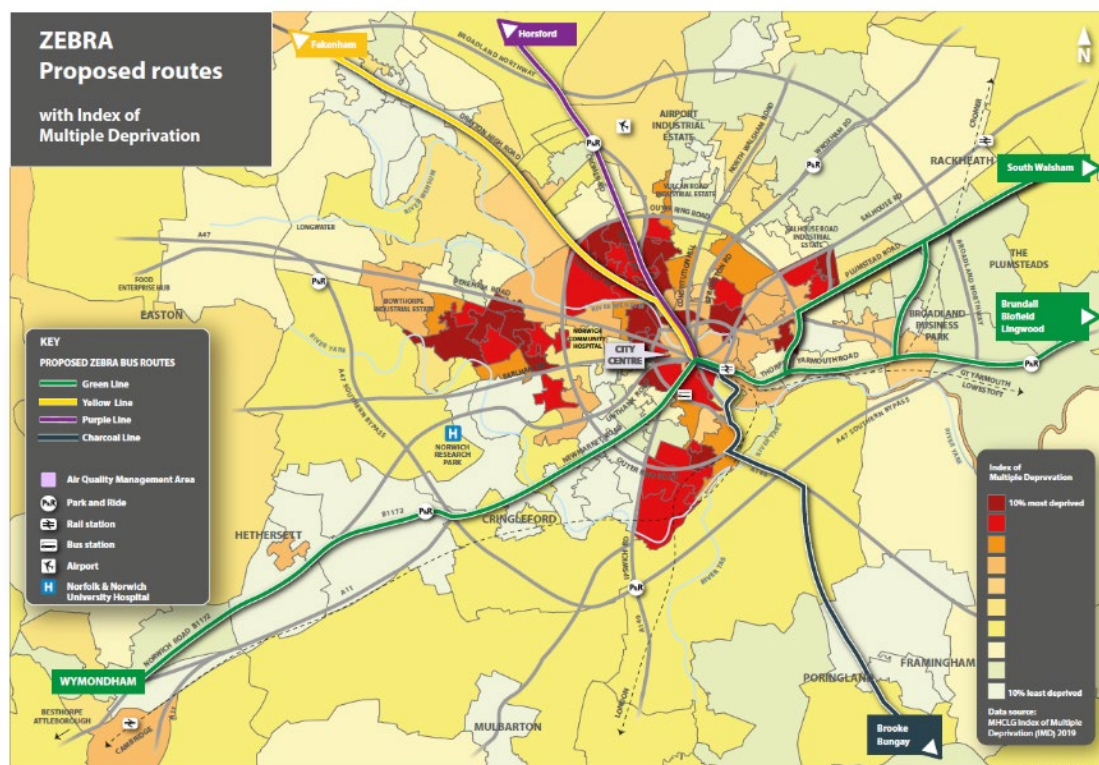
- 5.2.2 The Green Book (2020) requires investment proposals to demonstrate the case for a scheme by undertaking place-based analysis. In the context of ‘Levelling Up’, this analysis should indicate whether any place is deemed to be in need of ‘Levelling Up’ by presenting a range of socio-economic and transport data and comparing it with regional and national data sets.
- 5.2.3 We have undertaken a place-based analysis for Norwich using a methodology similar to that used within the recent ‘Levelling Up Fund’, and a method the DfT are soon to release in the form of ‘Levelling Up Toolkit’.
- 5.2.4 Considering socio-economic indicators first, Norwich performs worse than the regional and national averages for gross weekly earnings, unemployment rate, educational attainment and in the Indices of Multiple Deprivation, landing within the bottom three deciles for each metric. See **Table 5**.

TABLE 5: COMPARISON OF SOCIO-ECONOMIC INDICATOR

Category	Norwich	Regional average	National average
Gross weekly earnings	£505	£610	£587
Unemployment rate	4.4%	3.2%	3.9%
Employment rate	72%	77%	76%
Proportion of population educated to degree level or equivalent.	32%	37%	40%
Deprivation ranking out of 317 Local Authority Districts	52	Not applicable	Not applicable

5.2.5 The Social Mobility Commission's "State of the Nation 2017: Social Mobility in Great Britain" report¹ outlined that Norfolk's people are the least socially mobile within the Eastern region, with 29% of children living in income-deprived households in Norwich. In fact, 50% of areas in Norwich are considered to be in the 10% most deprived in the country. Norwich is identified as a social mobility 'cold spot'. **Figure 7** shows how the routes that will be operated by zero emission vehicles will serve the socially mobile 'cold spot'.

FIGURE 7: PROPOSED ROUTES AGAINST INDEX OF MULTIPLE DEPRIVATION



5.2.6 **Table 7** below presents transport connectivity for Norwich using the National Infrastructure Commission's transport connectivity data set². Transport connectivity is deemed to be another measure of a place's need for 'Levelling

¹

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/662744/State_of_the_Nation_2017_-_Social_Mobility_in_Great_Britain.pdf

² <https://nic.org.uk/data/all-data/transport-connectivity/>



Up' (DfT). The data considers intra-urban and inter-urban connectivity by car and public transport for 1,000 of the most populated places in Great Britain. The ranking of Norwich (out of 1,000) for each of these measures is outlined below. The higher the ranking, the worst the connectivity.

TABLE 6: TRANSPORT CONNECTIVITY IN AND TO NORWICH

Connectivity measures	Ranked position of Norwich out of 1000
Intra-urban connectivity (car)	978
Intra-urban connectivity (public transport)	955
Inter-urban connectivity (car)	455
Inter-urban connectivity (public transport)	52

- 5.2.7 The data indicates that Norwich is poorly connected by both car and public transport, both within the built-up areas and between urban and rural centres, falling into the worst decile in the intra urban metric. Norwich's inter-urban connectivity is the exception, with strong links into London, Ipswich and other regional cities.
- 5.2.8 There is a lack of public transport connectivity between some areas of population and employment on the edge of the city including the NRP, the NNUH and UEA cluster, Norwich International Airport (including the Airport Industrial Estate and the International Aviation Academy) and some of the other strategic employment sites, such as Broadland Business Park. Norwich International Airport is located on a corridor where investment is being made in bus priority measures as part of the Transforming Cities Fund (TCF) programme. Improved cycle, pedestrian and bus access to the airport from the International Aviation Academy and adjacent industrial estate, as well as the provision of a new mobility hub, is also included in the TCF programme.



- 5.2.9 The levels of households without cars or vans are distinctly higher in Norwich compared to both the regional and national levels (33.4% against 18.5% and 25.8%), and in contrast, the number of households with no cars or vans is lower in Broadland and South Norfolk than the regional and national averages (11.4% and 11.7% against 18.5% and 25.8% respectively). The reliance on bus for non-private vehicle individuals is greater to provide access to employment.
- 5.2.10 The New Anglia LEP identified that most employment sectors having a high growth potential have a strong presence in the GNR, including advanced manufacturing and engineering, agri-tech, health and life sciences, Information Technology and digital sciences. Other strengths of the GNR are tourism, retail, media and arts. To support retail and the arts, there is a need to extend the transport offer later into the evenings and during the weekend.
- 5.2.11 This analysis indicates that Norwich is deemed to be in need of 'Levelling Up'.

Summary of ZEBRA impacts on economic impacts / Levelling Up

- The ZEBRA bus routes not only serve areas of high multiple deprivation, the routes also link these areas with appropriate jobs and training at locations such as the Salhouse Road Industrial Estate, Airport Industrial Estate, Vulcan Road Industrial Estate, Broadland Business Park and Norwich city centre. This strongly supports the Norfolk BSIP, where there is a clear commitment to transition to zero emission buses, as well introduce complementary elements related to affordable and simple fares, improved reliability and upgraded on-board facilities.
- There is a strong fit with investment through the TCF fund in bus priority measures along bus corridors linking residential areas with employment on the edge of the city and city centre, as ZEBRA-funded bus routes operate along these corridors where investment is being



made. Enhancing accessibility to key employment centres and training for some of the most deprived communities is a critical part of the TCF programme and the provision of high-quality, accessible buses, through the ZEBRA programme will improve the overall quality of service for those who choose to use the bus.

- Norwich is poorly connected by both car and public transport. ZEBRA funding will form an important element of the Norfolk BSIP that has clear outcomes to grow bus patronage, increase rural accessibility and increase the bus mode share from cars.
- The reliance on bus for individuals, with no access to private vehicles, to provide access to employment, training and education is higher in Norwich than the regional and national pictures. Delivering a step change in the quality of the bus experience will strongly support this.
- The Norfolk ZEBRA proposal delivers strongly against assessment criteria considered by Government in terms of support through 'Levelling Up', which include deliverability, strategic fit with local and government priorities and value for money.

5.3 Reduce Environmental Impacts

- 5.3.1 Norwich has an air quality problem that is recognised locally, regionally and nationally as needing urgent action. The World Health Organisation (WHO) has identified Norwich as one of 32 UK cities exceeding the WHO air pollution levels.
- 5.3.2 Norwich City Council has monitored air quality in the city since 1998. In November 2012, all four previously declared AQMAs were amalgamated into a single AQMA, which covers large areas of the city. Castle Meadow, within the AQMA, acts as a transport hub, containing many bus stops that serve the wider Norwich area and is the most heavily-used street for bus movements in the city. All the bus routes outlined in this application that will operate zero emission vehicles serve Castle Meadow and run through the AQMA,



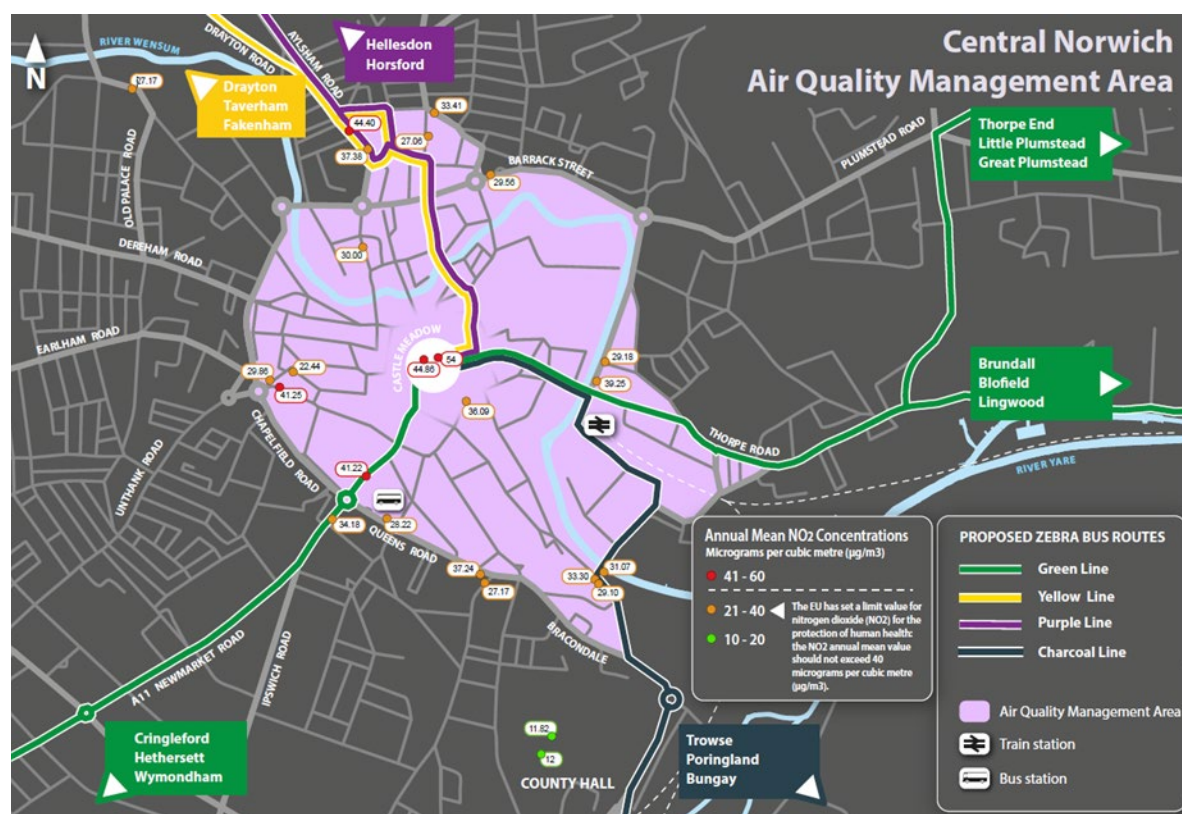
replacing diesel buses. **Figure 8** shows how the ZEBRA routes intersect the AQMA.

- 5.3.3 The major pollutant source in the city is road traffic and source apportionment exercises in Norwich have identified oxides of nitrogen from road traffic to be the most significant source of nitrogen dioxide (NO₂) and, more specifically, buses to be the main contributor. All the buses serving the AQMA are currently diesel and account for the majority of NO_x on our most polluted streets where only buses and taxis are allowed.
- 5.3.4 The automatic analyser in the Castle Meadow LEZ shows that, despite efforts to improve air quality, there are still challenges, as annual mean NO_x levels have fairly consistently exceeded the objective level. Historic data shows the exceedance to oscillate around 14µg/m³ above the objective level.
- 5.3.5 There are a number of city centre streets where NO_x annual mean levels exceeded the European limit in 2019, which include Castle Meadow (45 µg/m³) and St Stephen's Street: (41 µg/m³). Exposure to emissions from the bus fleet on Castle Meadow and St Stephen's Street is a particular concern with large numbers of new residential (student) dwellings on these streets recently becoming occupied. In addition, these streets are made up of near continuous business frontages and bus stops, as well as Norwich Castle, with associated high footfall. All the bus routes outlined in this application that will operate zero emission vehicles also serve St Stephen's Street as well as Castle Meadow.
- 5.3.6 The TCF programme currently being delivered in Norwich is forecast to improve air quality in the city centre through changes to the highway network and investment in cleaner vehicles. Air pollution in Castle Meadow is forecast to reduce by 11%, with a reduction at Norwich rail station of up to 17%. Both of these areas will be served by zero emission buses delivered through the ZEBRA programme. Greenhouse gases within the wider city region were forecast to reduce by around 650 tonnes (CO₂). In addition to these

reductions, the Norfolk ZEBRA proposal is forecast to reduce an additional 600 tonnes of carbon and 9.2 tonnes of local air -quality-related emissions of NO_x and PM_{2.5}. We can be confident that the annual mean NO_x concentrations highlighted in the **Figure 8** that are red and amber, where the routes cross these points, will reduce from their current figures.

- 5.3.7 A key objective of the ZEBRA programme is to “Support the government’s commitment to decarbonisation and to reduce the transport sector’s contribution to CO2 emissions” – the Norfolk ZEBRA application is fully consistent with this.

FIGURE 8: CENTRAL NORWICH – AIR QUALITY MANAGEMENT AREA AND ZEBRA SELECTED ROUTES



5.4 Improving Transport for the User

- 5.4.1 We know from Transport Focus bus passenger surveys conducted in Norwich and Norfolk in 2017/18, which is the most recent survey data we



have, that 18% of respondents wanted improvements to bus design, comfort and condition. This was the second most wanted improvement in the survey. This proposal will directly address this through the provision of new, modern, high specification, fully accessible vehicles, which will replace old, dated, low specification ones. The new buses set out in this proposal represent a significant improvement in terms of passenger comfort, journey quality and accessibility compared to current buses that will be replaced.

5.4.2 The zero emission electric buses will provide the enhanced levels of accessibility required for buses funded by government (the enhanced Public Service Vehicles Accessibility Regulations [PSVAR] standards) which are of the following:

- A second priority wheelchair space (flexible),
- Hearing loops,
- Space for assistance dogs,
- Audible and visible information for next-stop information.

5.4.3 REDACTED

5.4.4 There are many positive impacts of this proposal for users with protected characteristics, with some groups having a larger positive impact than others. There are some potential adverse impacts, and these have been outlined, as well as proposed mitigation measures, in the Equality Impact Assessment that accompanies this application. Overall, it is not anticipated that there will be a residual adverse impact to those with protected characteristics.

5.4.5 REDACTED

5.4.6 The Transport Focus survey in 2017/18 in Norwich highlighted that improved punctuality was the most wanted improvement. Though this proposal will not directly affect punctuality of the buses, the passengers will have visual and audible announcements in the new buses, which will provide bus users with



the reassurance as to how their journey is going, whether it is on time or not, and what connecting services there are. The TCF programme in Norwich is delivering bus priority infrastructure to reduce bus journey times and improve reliability. This is strongly complementary to the provision of new, high-quality buses.

5.5 Other schemes that complement these proposals

Transforming Cities Fund (TCF)

5.5.1 TCF funding is being invested in five clean transport priority corridors, in addition to the city centre, that will deliver the maximum impact in terms of:

- improving people's productivity and social mobility by unlocking access to employment and education opportunities across the city region,
- increasing the efficiency of travel and transport and improve the impact transport has on carbon emissions, air quality and public health,
- using emerging technology to prepare the city region for a future of shared and clean mobility.

5.5.2 Bus routes that will benefit from zero emission buses funded through the ZEBRA programme will also benefit from bus priority schemes delivered by our TCF programme. A summary of this is outlined in **Table 7** below.



TABLE 7: BENEFITS TO ZEBRA BUS ROUTES FROM TCF PROGRAMME

Intervention	Green Line	Yellow Line	Purple Line	Charcoal Line
Traffic light priority at junctions – scheme to be delivered 2022	Yes	Yes	Yes	Yes
St Stephen's Street – improved access to and from bus stops – scheme to be delivered 2022	Yes	Not applicable	Yes	Yes
Eastbound traffic restriction in city centre – scheme to be delivered 2022	Yes	Not applicable	Not applicable	Yes
Norwich Rail Station – bus priority adjacent to station – scheme to be delivered 2022	Yes	Not applicable	Not applicable	Not applicable
Thorpe Road – bus and cycle contraflow bus lane – scheme complete (journey time savings of 1.5 - 2.5mins per bus per journey)	Yes	Not applicable	Not applicable	Not applicable
Cromer Road / Aylsham Road Bus Lane – scheme complete (journey time savings of up to 4mins at peak times)	Not applicable	Not applicable	Yes	Not applicable
Newmarket Road – junction priority measures – scheme to be delivered 2022	Yes	Not applicable	Not applicable	Not applicable
Tombland – public realm improvements works and transport interchange improvements – scheme complete	Not applicable	Yes	Yes	Not applicable
Heartsease Fiveways junction– improvements to bus, cycle and pedestrian facilities – scheme to be delivered 2023	Yes	Not applicable	Not applicable	Not applicable

5.6 Summary of Bus Service Improvement Plan (BSIP) proposals

5.6.1 Over the last six months, NCC has led a collaborative process to prepare a Norfolk BSIP with all bus operators that provide a service in Norfolk, which includes First Bus. Founded upon a widely and fully endorsed set of simple



objectives and outcomes, the Norfolk BSIP presents an ambitious programme of measures and schemes based around the theme of ensuring buses play their full part in the county's journey towards a net zero Norfolk transport system.

5.6.2 The Norfolk BSIP programme is focused on three important areas. In the short term, getting people back on the bus; over a three-year period, achieving a new minimum standard of service in Norfolk that allows people to base their lives around relying on the bus; and in the longer term, upgrading the bus fleet to ensure it is modern and achieves zero emissions from the tailpipe.

5.6.3 The objectives set out in the Norfolk BSIP are as follows:

- To rebuild and increase passenger confidence,
- To have a green and sustainable transport offer,
- To have a public transport network that is the first-choice mode for most journeys, for existing and new customers,
- To have a simple and affordable fares and ticketing offer.

5.6.4 The following key outcomes are outlined in the Norfolk BSIP:

- **Grow annual bus patronage in Norfolk:** return to 2019/20 patronage levels by March 2023, then grow bus patronage in the County by 1% per annum between 2023 and 2027. The baseline for this outcome is 28.911 million journeys.
- **Improve bus passenger satisfaction:** grow bus passenger satisfaction with bus services in Norfolk, as measured by Transport Focus, to 95% by 2027. The baseline for this outcome is 89% satisfaction measured by Transport Focus in 2017.
- **More buses with next-stop announcements and displays:** increase the number of buses operated on registered bus services in Norfolk



that offer next-stop announcements (visible and audible) to 100% by 2025. The baseline for this outcome is 7%.

- **Greener buses:** increase the proportion of buses operating on passenger services in Norfolk to either be built to Euro 6 emission standards, retrofitted to Euro 5 and 6 emission standards or built as zero emission buses to 50% by 2027. The baseline for this outcome is 17% in September 2021.

5.6.5 The new zero emission buses outlined in the Norfolk ZEBRA application will support and deliver against all four of these outcomes.

5.6.6 The delivery of BSIP measures is outlined as follows and is summarised in **Table 8:**

- In the immediate term (0-6 months, starting April 2022 if not sooner) we will put in place a comprehensive and imaginative marketing campaign aimed at getting people back on the bus, quickly returning patronage levels to much nearer their pre-COVID levels. A number of measures that are complementary to this campaign will also be pursued, as will laying the groundwork for subsequent major bus investment.
- In the medium term (6 months to three years, by March 2025) we will deliver bus priority measures and improvements to our bus network and ticketing that will ensure many more people can rely on the bus to live their lives day to day, allowing them to rely less on their motor car. The measures will support lifestyle choices in both built-up and rural areas.
- In the longer term (three to five years) we will continue to roll out infrastructure and new services to support car-free lifestyle choices while also seeking a comprehensive Norfolk BSIP funding solution that allows the county to make a rapid and lasting move towards zero



emission buses, exploiting the latest battery electric and hydrogen technologies that will be available from 2025 onwards.

TABLE 8 (ACCESSIBLE): STAGED APPROACH TO DELIVERING THE BSIP

Norfolk BSIP – A Roadmap to Net Zero

Get people on the bus:

(0 – 6 months)

- Major marketing campaign and an identity for buses
- Integrated journey planner
- Single customer charter
- Fares offer for Under-21s
- Back to bus fares promotion
- Contactless on every bus
- Improves road network management
- Network review and bus priority studies

Supporting lifestyle choices:

(6 months to end of Year 3)

- Deliver consistent bus network standards
- Agreed timetable change dates
- Bus priority programme
- Better bus stop standards
- Multi-operator fares with common zones and fare capping
- Better service integration and hubs
- Next-stop announcements and displays on all buses

Towards net zero for buses

(By end of Year 5)



- More modern buses
- Zero emission buses

Network review and bus priority studies

- 5.6.7 A key element of the Norfolk BSIP in relation to bus priority measures is to ensure that many more bus users travelling along key corridors can have a fast and reliable bus service irrespective of the prevailing general traffic conditions in that corridor. This is another aspect of our commitment to delivering a bus service across Norfolk that more people can build their lives around, travelling by bus as part of their day-to-day lifestyle choices.
- 5.6.8 Norfolk has already implemented a number of bus priority schemes and thanks to funding from the TCF, three more corridors in Norwich are currently being upgraded with comprehensive bus priority investment. The Norfolk BSIP will build on that by seeking funding for bus priority lanes along Yarmouth Road and Plumstead Road, which are routes served by buses outlined in this ZEBRA application.
- 5.6.9 All bus priority measures will be assessed by the County Council to ensure they provide good value for public money, prior to their implementation. All measures will only be delivered once all democratic and regulatory processes have been completed, in line with normal practice.
- 5.6.10 In terms of linkages between the Norfolk BSIP and ZEBRA, the Norfolk BSIP outlines a commitment to zero emissions buses to start decarbonising and further reducing tailpipe emissions from the bus fleet in Norfolk. A successful award of ZEBRA funding would enable our Norfolk BSIP to 'hit the ground running' and establish a firm foundation to build upon. This would give Norfolk a head-start in terms of better understanding the challenges of introducing zero emission buses and supporting infrastructure to inform



future government support for future roll-out – this is one of the ZEBRA programme objectives. In addition, ZEBRA funding would provide a catalyst for delivery of complementary outcomes of our Norfolk BSIP, such as improved bus service satisfaction, more buses with next-stop announcements and more reliable services.

- 5.6.11 Norfolk benefits from a bus network that has developed thanks to close, regular and overwhelmingly positive collaboration between the County Council and bus operators. The spirit of partnership in Norfolk means that we are agile and ready to respond to new initiatives and funding opportunities for buses as they arise. This is evidenced by our 'Norwich Bus Charter', our joint working on the Bus Punctuality Improvement Partnership, our successful bid to the TCF in Norwich and our current work on demand responsive transport. We conduct quarterly all-operator meetings and the individual contact we have on an at least a monthly basis helps us to resolve issues, discuss long-term plans and implement network changes to the benefit of residents. We have had extensive engagement on the transition to cleaner and zero emission buses and in support of our current ZEBRA application, NCC and bus operators wish to introduce 100 new zero emissions buses in 2025/26, with a further 100 new zero emission buses the following year. While First Bus is ready to introduce zero emissions buses in Norwich now, both financially and operationally, subject to a successful award of ZEBRA funding, other bus operators are not yet currently in the same position. This is largely due to the significant up-front investment needed in vehicles and supporting infrastructure. Whilst other bus operators are supportive of transitioning to zero emission fleets, further discussions are required to jointly identify a funding mechanism that will work for them. We would very much like to bring the DfT into those discussions if appropriate.
- 5.6.12 Funding will be required for the installation of suitable charging infrastructure (for battery electric buses) or fuelling infrastructure (for hydrogen fuel cell buses). Where such infrastructure is installed, steps will be taken to ensure



that a wider selection of vehicles can benefit from the charging and fuelling facilities, beyond just buses – for example local authority fleets and local companies with zero emission fleets.

6 Objectives of the scheme

- 6.1.1 When setting out the objectives of this scheme, we have considered the specific objectives of the ZEBRA programme and the wider priorities of the DfT. **Table 10** presents the specific objectives of this scheme and how these align with the ZEBRA and wider DfT priorities.



TABLE 9: OBJECTIVES OF THIS SCHEME AND ALIGNMENT WITH OTHER OBJECTIVES AND PRIORITIES

Scheme Objective	ZEBRA Programme Objective	Wider DfT Priorities
Decarbonisation.	Support the Government's commitment to decarbonisation and to reduce the transport sector's contribution to CO ₂ emissions.	Reduce environmental impacts / air quality.
Grow and level up the economy.	Support bus manufacturers in the UK in their development of zero emission bus technology.	Grow and level up the economy.
Improve the travel experience for bus users (accessible buses / cleaner buses).	Not Applicable	Improve transport for the user.
Ensure Norfolk is well placed to increase roll-out of zero emission buses in the future.	Support partnership working between Local Transport Authorities, bus operators, and other local stakeholders as set out in the National Bus Strategy. Understand better the challenges of introducing zero emission buses and supporting infrastructure to inform future Government support for ZEBs. Support the roll-out of the 4,000 Zero Emission Buses that the Government committed to in Feb 2020.	Grow and level up the economy. Reduce environmental impacts / air quality. Improve transport for the user.

7 Supporting ZEBRA programme objectives

Support the government's commitment to decarbonisation and to reduce the transport sector's contribution to CO₂ emissions

- 7.1.1 This proposal supports the government's commitment to decarbonisation and to reduce the transport sector's contribution to CO₂ emissions by removing at least 600 tonnes of CO₂ per annum in Norwich, as well reduce 9.2 tonnes per annum of local air quality-related emissions of NO_x and PM_{2.5}. A successful



Norfolk bid will act as springboard for more zero emission buses to be introduced in Norfolk through the Norfolk BSIP, supported by future public and private funding, which will further support this commitment

- 7.1.2 Monitoring and Evaluation (M&E) that supports the delivery of the Norfolk ZEBRA programme will help to quantify the impact that zero emission buses have on decarbonisation and CO₂ and meeting this commitment.

Support the roll-out of the 4,000 Zero Emission Buses that the Government committed to in Feb 2020

- 7.1.3 This proposal supports the government commitment in the roll-out of 4,000 zero emission buses as this Norfolk ZEBRA bid will deliver 15 of the 4000 zero emission buses. A successful Norfolk bid will act as springboard for more zero emission buses to be introduced in Norfolk through the Norfolk BSIP, supported by future public and private funding.
- 7.1.4 The Norfolk ZEBRA proposal has provided the opportunity for First Bus to look at the requirements needed at their depot to facilitate the electrical power and charging for the 15 buses outlined in this proposal, as well as what would be needed if all buses at the depot were to be electric at some point in the future. Future proofing of the site in terms of power supply strongly supports the overall aim of First Bus, NCC and the Government in terms of introducing more zero emission buses. During this investigation, this proposed scheme was highlighted to OFGEM who have since allocated separate funding from the Green Recovery Fund to reinforce the electrical distribution network in Norwich near to the First Bus depot. This has resulted in the Distribution Network Operator (DNO) connection costs for this proposal being significantly lower than would have been the case otherwise.
- 7.1.5 Delivery of the upgrade with an HV cable and power supply at the depot would future-proof the depot for the entire fleet and not just the vehicles outlined in this application. ZEBRA funding sought will cover the depot



upgrade to support electrical charging and charging infrastructure for the 15 vehicles outlined in this proposal.

Support bus manufacturers in the development of zero emission bus technology

7.1.6 REDACTED

7.1.7 REDACTED, **Figure 9**, REDACTED.

FIGURE 9: BUS

Picture redacted

Understand better the challenges of introducing zero emission buses and supporting infrastructure to inform future government support for ZEBs

7.1.8 REDACTED

7.1.9 Monitoring and Evaluation (M&E) that supports the delivery of the Norfolk ZEBRA programme will identify learnings relevant to the introduction of zero emission buses. This will, for example, help to understand how the design, manufacture and weight of buses affects vehicle range and general operation. DfT will therefore obtain different learnings from the Norwich ZEBRA roll-out compared to other cities that may opt for a more conventional electric bus design based on a retrofit approach.

Support partnership working between Local Transport Authorities, bus operators, and other local stakeholders as set out in the National Bus Strategy

7.1.10 Norfolk benefits from a bus network that has developed thanks to close, regular and overwhelmingly positive collaboration between the County Council, bus operators and our communities. The spirit of partnership we have in Norfolk means that we are agile and ready to respond to new initiatives and funding opportunities for buses as they arise. The Norfolk



ZEBRA application is based on a strong partnership that already exists and supports the key outcomes outlined in the Norfolk BSIP to grow annual bus patronage, improve bus user satisfaction, provide more buses with next-stop announcements (visual and audible) and provide more greener buses.

8 Supporting wider priorities

Grow and Level Up the Economy

- 8.1.1 This priority is all about improving connectivity and growing the economy across the UK by enhancing transport networks. Investment through the TCF is part of this, which is already delivering significant benefits to bus journeys in Norwich. There is a clear linkage between our ZEBRA and TCF programmes as many of the TCF projects currently being delivered in Norwich will directly benefit bus routes where new, zero emission buses will be introduced through ZEBRA, collectively providing a step change in the quality and performance of the bus network and linking sustainable transport modes. An example is Norwich rail station where the TCF is delivering an enhanced transport hub with bus priority access to the station, improved access for walking and cycling and a more efficient interchange between bus and rail services. The Green Line bus route, which forms part of this ZEBRA application, serves Norwich station so those travelling from further afield, or locally, to or from Norwich station will benefit from a significantly enhanced transport network and connectivity, both in terms of the physical network / vehicle and information provision.
- 8.1.2 The depot infrastructure upgrade mentioned in this ZEBRA proposal could provide opportunities for local businesses who have considered upgrading their fleet to battery electric vehicles but found the infrastructure lacking or the costs prohibitive. The DC Rapid dual-headed CCS plug chargers being procured are interoperable with the majority of EV manufactured vehicles. First Bus would always have priority regarding the use of charging infrastructure at their depot and would charge the buses overnight and the



Rapid Electric Vehicle Chargers would be available during the daytime. First Bus are investigating solutions which will enable the possibility of other business users who have the potential to transition to electric vehicles to utilise this availability.

- 8.1.3 A new business could be created managing the provision of a day-time charging solution to other business users which will work on a bookable platform. This would provide Fleet Managers the confidence that the charger will be available when the vehicle arrives and that the chargers will work. First Bus are currently working on the full solution which will be hosted and controlled by partner to facilitate this. A successful deployment of this service would be a cumulative improvement in tackling climate change.

Reduce Environmental Impacts / Air Quality

- 8.1.4 This priority is based around tackling climate change and improving air quality by decarbonising transport. Our ZEBRA proposal supports this by removing tailpipe emissions from 15 of the worst polluting diesel buses in Norwich, bringing immediate benefit to the quality of air inside and outside these buses. The Norfolk ZEBRA proposal is forecast to remove at least 600 tonnes of CO₂ per annum in Norwich, as well reduce 9.2 tonnes per annum of local air quality-related emissions of NO_x and PM_{2.5}.

Improve Transport for the User

- 8.1.5 This priority is based around building confidence in the transport network as the country recovers from COVID-19, improving transport users' experiences and ensuring that the network is safe, reliable, and inclusive. Our ZEBRA proposal supports this by delivering a step change in the transport user experience through the provision of modern, comfortable, accessible and safe buses that provide visual and audible information. These attributes are also consistent with outcomes sought to be delivered through the Norfolk BSIP. Complementary investment in bus infrastructure in Norwich through



our TCF programme is already delivering faster and more reliable journey times for bus users, which will only increase further as our TCF programme nears completion in 2023.

8.2 Summary

8.2.1 This proposal will allow for the replacement of 15 Euro 3 single-decker vehicles in Norwich on a 'like for like' basis with 15 single-decker fully electric buses. There will not, therefore, be an increase in vehicle numbers due to the move to electric vehicles. The majority of the First Bus fleet in Norwich is operated by double deckers, so this proposal covers 38% of the single-decker fleet. The 15 vehicles in this proposal represent the Peak Vehicle Requirement (PVR) of the routes selected, so all vehicles covering a service on these routes would be zero emission. More single-decker vehicles are not included in this application because they currently operate on routes that will be converting to double decker in the future and / or are on routes that would exceed the existing battery range.

8.2.2 The routes chosen for this bid will operate in the GNR and are based on the ability to operate single-decker vehicles, from a capacity perspective, and the ability to operate the associated mileage, from a battery range perspective. All bus routes that will be upgraded to operate with the zero emission buses travel through the LEZ and AQMA in Norwich city centre where the highest level of emissions is found.

8.2.3 REDACTED

8.2.4 Bus routes chosen for this proposal are outlined below. These can also be found in the bus map in **Figure 1**.

- **Green Line:** Bus routes 15 / 15A / 15B,
- **Yellow Line:** Bus route 29,
- **Purple Line:** Bus route 39,



- **Charcoal Line:** Bus routes 40 / 40A.

8.2.5 This proposal relates to First Bus only and equates to 7 of their 49 services within the GNR being zero emission (14%).

8.2.6 In addition to the 15 new zero emission electric buses, this proposal includes electrical upgrade work to the First Bus depot in Norwich, which includes power supply and charging infrastructure. The depot is marked in pink in **Figure 1**.

8.3 Process followed to identify the preferred approach

8.3.1 The preferred approach is based on discussions with bus operators and consideration of the provision of electrical energy and hydrogen in Norfolk, both now and within the timescales for delivery of this proposal.

8.4 Options considered

8.4.1 All bus routes and bus operators across Norfolk were initially consulted but this was reduced in scope when discussions with bus operators indicated whether they were able to support an application financially and operationally. This was further reduced in scope when the decision was made to focus on the GNR as this is the area of worst air quality and where the largest number of buses operate. Options then considered were the use of buses powered by either electricity or hydrogen and whether vehicles should be single or double deckers, which then determined the number of vehicles that were in scope for this application. More information on this option consideration is outlined below.

8.5 Preferred approach

Why the number of buses proposed?

8.5.1 This proposal will allow for the replacement of 15 Euro 3 diesel single-decker vehicles in Norwich on a 'like for like' basis with 15 single-decker fully electric



buses. The routes chosen for this bid, which has determined the number of vehicles required, are based on the ability to operate single deck vehicles, from a capacity perspective, and the ability to operate the associated mileage, from a battery range perspective. These routes can all operate using an overnight charge, avoiding the requirement for opportunity charging during the day. Topographical restrictions, such as low bridges and trees, have also been considered. The 15 vehicles will be fully utilised with none of these vehicles being allocated as spares and represents the Peak Vehicle Requirement (PVR) of the routes selected. All vehicles operating these routes will therefore be zero emission.

8.5.2 REDACTED.

Why the bus operator proposed?

8.5.3 There are eight (8) bus operators operating registered local bus services in the GNR and twelve (12) who operate services across Norfolk. Discussions were held with all bus operators in Norfolk and although many are keen to transition to zero emission or lower emission vehicles, only First Bus were in a position to provide the financial and operational commitment to participate in this application. We remain in close dialogue with all other bus operators so that we are in a position to move forward together as part of the Norfolk BSIP on joint funding / delivery of zero emission vehicles should financial and operational commitments change.

Why the routes proposed?

8.5.4 The defined area of the GNR, as shown in **Figure 3**, has been chosen as this is the area of worst air quality in Norfolk and where the largest number of buses operate through the AQMA. This will ensure there is the maximum impact on addressing poor air quality in this area. All the bus routes included in this ZEBRA proposal operate through the LEZ in Norwich City Centre where the highest level of emissions is found.



- 8.5.5 The routes proposed provide transport from areas of deprivation to key employment centres, e.g. Purple Line covers the route through Mile Cross travel to the Airport Industrial Estate and the Green Line goes to the Broadland Growth Triangle. See **Figure 7**. Both are areas of significant growth. These routes have been proposed as they provide opportunity to meet the 'Levelling Up' agenda.
- 8.5.6 All routes operated by First Bus in the GNR have been analysed for their suitability of vehicle type, given the current proposed vehicle for this bid is a single-deck bus. Capacity analysis was vital to ensure that routes being offered could be operated by single-deck buses and that capacity was sufficient. Pre-pandemic capacity data from September to October 2019 was used. Regular reviews will continue to be undertaken to ensure suitable capacity is deployed across routes as we emerge from the pandemic.
- 8.5.7 First Bus examined the recorded passenger loadings of their routes to determine whether any routes that are currently operated by double-decker buses could be converted to single-decker buses. The analysis showed that there weren't any current services that could be switched to a single-deck vehicle operation.
- 8.5.8 The bus routes selected have considered that the buses' batteries should have suitable capacity to operate the full day's range, removing the requirement for opportunity charging during the day. First Bus National Fleet and Operational strategy is that each business case for vehicle investment should revolve around overnight in-depot DC charging, ensuring that the bus route schedule can be fully completed around the range of the electric bus, with a % built in for future degradation, on one overnight charge. In the current environment with routes that are operating on mixed traffic roads, the variability of traffic and external factors (road works, diversions, congestion) pose notable challenges to operations. Imposing an artificial restriction on the operation through the requirement to spend an amount of time at a specific



location in order to take on power to complete the route will risk impacting performance as well as reducing the flexibility that operations supervisors rely on to 'step up' vehicles to recover service in the face of highway or operational issues.

8.5.9 The bus routes chosen for this proposal are outlined below. These can also be found in the bus map in **Figure 1**.

- **Green Line 15 / 15A / 15B.** 8 single decks for Green Line services 15/15A that operate between Lingwood, Broadland Business Park through Norwich City Centre and out via Hethersett to Wymondham. There is a low bridge at the Lingwood end of the route.
- **Yellow Line 29.** 2 single decks for Yellow Line service 29 that link the suburban estate of Taverham with the city centre. There are numerous low hanging trees at the Taverham end of the route.
- **Purple Line 39.** 3 single decks for Purple Line service 39 that operate cross city, linking the suburban estates of Lakenham and Mile Cross with the city centre. There is a low bridge at the Lakenham end of the route.
- **Charcoal Line 40 / 40A.** 2 single decks for Charcoal Line services 40/40A that link the town of Poringland with the city centre. There are numerous low hanging trees at the Poringland end of the route.

Why the technology type?

8.5.10 Discussions with First Bus highlighted that they, as a national bus operator, are engaging in trials and permanent bus operations around the UK that include both electric and hydrogen propulsion as a means of achieving zero emissions at tailpipe. Having considered their operational arrangements in Norwich in terms of route network extent, daily vehicle mileages, depot locations, fleet composition, availability of fuel (electricity / hydrogen) and



commercial discussions already advanced with bus manufacturers, it is considered that electric propulsion is most appropriate for Norwich.

- 8.5.11 Battery electric power is in a more advanced state in the market and First Bus now has confidence in this having operated Battery Electric Vehicles (BEV)s from a number of manufacturers, gaining knowledge of how to install and safely operate the infrastructure and vehicles.
- 8.5.12 The development of alternative fuelled vehicles such as hydrogen remains a continually assessed element of a longer-term strategy. However, given the current position of the BEV market, the timelines for deployment required for this funding, and the price point of available vehicles and infrastructure, BEV is the most suitable choice for this deployment.
- 8.5.13 At present, there is no dedicated hydrogen supply, storage or distribution infrastructure in Norfolk. NCC has secured funding through the Community Renewal Fund to look at the feasibility of using hydrogen to fuel HGVs but this is at an early stage of assessment.
- 8.5.14 Our proposal fully complies with the accessibility requirements set out in the scheme guidance. The vehicle proposed in this application is a transformational product, built from the ground up as an electric vehicle from the outset, setting new standards in terms of driver and passenger comfort, accessibility, information provision and operational performance compared to existing legacy products.

Why the infrastructure type?

- 8.5.15 The infrastructure type outlined in this application is based around the provision of battery electric buses. During 2020, the UK bus industry feedback was that all buses manufactured in the future will be DC charged. All First Bus depots across the UK will only have CCS2 Plug DC chargers fitted upon transformation to EV to ensure all First Bus operating companies



can accommodate future cascades and movement of vehicles between depots and areas.

- 8.5.16 First Bus have based their selection for the chargers from the Caledonia procurement tendering in January 2021. 16 companies were invited to bid and 3 successfully met their criteria, which included the chargers must be capable of third-party use and have Service Level Agreements (SLAs) included.
- 8.5.17 There has been close engagement with electrical energy companies when preparing this proposal. First Bus has worked directly with the Distribution Network Operator (DNO) for the Norwich area. The use of overnight charging in depot avoids the need for on-route charging away from the depot during the day. The ability to ensure each vehicle is charged and capable of undertaking their planned mileage at the beginning of the day provides a level of assurance in the operational performance.
- 8.5.18 First Bus has engaged with an energy consultant to professionally scope out the infrastructure requirements needed. A summary of this is as follows:
- The local DNO REDACTED
 - A maximum power demand of 3.85MVA would be required if all vehicles at the depot were to be charged. It should be noted that First Bus worked with the DNO to support their application to apply for OFGEM Green Recovery Funding. The Green Recovery Fund's purpose is to help accelerate 'shovel-ready' green projects in an area, providing DNOs with additional funding to develop their power networks / increase their low carbon capacity. The additional capacity in the network will benefit First and all businesses and sectors wishing to connect to the enhanced electrical infrastructure. The bid was successful and will go ahead regardless of the outcome of the ZEBRA project. This separate upgrade to the electrical supply has reduced the level of funding sought through this application.



- Local DNO network is currently considerably constrained on 2 of the 3 substations. There appears to be sufficient capacity on the closest substation, which is just over 1km away.
- The depot is in part of the city where currently headroom exists to support the demand required to electrify the fleet. However, there are significant development activities planned in and around the city centre over the next five years which could increase the risk of network reinforcement. Early engagement with the DNO is required to outline future plans for the depot.

8.5.19 The power supply upgrade at the depot will provide enough power to supply the chargers being deployed in this installation to charge the 15 buses outlined in this application overnight. REDACTED

8.5.20 The civils costs included in this bid were based on the tender return in Glasgow which is the most recent and like-for-like project being undertaken. REDACTED

8.5.21 REDACTED

8.5.22 Upgrades to the electrical power network to deliver the energy required is fully achievable with the timescales required for delivery of this funding programme.

Why the preferred vehicle manufacturer?

8.5.23 A comprehensive First Bus procurement process has selected a vehicle manufacturer based on a full tender procurement for the project. REDACTED. The criteria on this application is:

- Their product is homologated, certified and meets the original requirements of the tender,
- The price remains at the current level,



- There are no changes to competitor products, i.e. significant reductions in price, improved range or other enhancements.

8.5.24 First Bus have experience with several other bus manufacturers and work closely with them running their existing fleet. First Bus are always evaluating new products and suppliers as they bring new products to market.

Why is this approach to operators, vehicles, technology and infrastructure most suitable to meet objectives?

8.5.25 The option of implementing 15 electric, single-decker buses in Norwich in partnership with First Bus is most suitable to meet the objectives of the ZEBRA programme because:

- First Bus are in a position to partner with NCC through the provision of match funding and operational readiness,
- A review of the bus network and routes in Norwich has identified where an electric, single-decker vehicle is well suited to operate in terms of capacity, route length and topographical features, requiring only an overnight charge.
- Commercial and operations experience within First Bus has identified that battery electric vehicles are more appropriate than hydrogen at the current time. In addition, there isn't a hydrogen network infrastructure currently in place in Norfolk,
- A suitable power upgrade of the local electrical supply network can be achieved within the timescales of delivery and the separate receipt of Green Recovery Funding enables the distribution network near the First Bus depot to be enhanced, resulting in the DNO connection costs required for this proposal being significantly less than would otherwise have been the case,



- The electrical upgrade of the power supply near the First Bus depot through the Green Recovery Funding future-proofs the depot for additional electric buses to be charged in the future,
- There is the potential shared use of charging equipment to benefit the wider community. Business to business charging services would be possible, supporting the 'Levelling Up' agenda and helping other businesses to move towards electrifying their fleet without having to invest in infrastructure.

Changes since Expression of Interest

- 8.5.26 There has been a small 0.5% increase in overall costs. The grant cost has increased by 0.8%.
- 8.5.27 The cost of the zero emission buses has changed from £5.23m in the EOI to £5.5m in this FBC. This increase is 5.06% and is in line with the inflation assumptions specified for the infrastructure and current UK inflation rates.
- 8.5.28 Non-bus costs have reduced overall from £1.618m to £1.338m. Whilst there was an increase in the civil engineering costs, as a result of accurate quotations being obtained, this has been more than offset by a reduction in the DNO costs required as a result of the separate Green Recovery Fund initiative being delivered irrespective of the outcome of this application.
- 8.6 How the proposal meets scheme's objectives, core policy objectives of ZEBRA and wider strategic priorities of DfT**
- 8.6.1 **Table 11** below outlines how the proposal meets the schemes objectives, as well as those of ZEBRA, DfT and the Norfolk BSIP.



TABLE 10: HOW THE PROPOSAL MEETS OBJECTIVES

Scheme Objective	Objectives and Priorities	How do the outcomes of the scheme meet the objective?
Improve air quality.	<p>ZEBRA Programme Objective Support the Government's commitment to decarbonisation and to reduce the transport sector's contribution to CO2 emissions.</p> <p>Wider DfT priorities Reduce environmental impacts / air quality.</p> <p>Bus Service Improvement Plan To have a green and sustainable transport offer.</p>	<p>38% of the single-decker fleet operated by First will be zero emissions. New buses will replace 15 Euro 3 buses. This will have the largest possible impact on improving air quality as all new zero emission buses will operate through the AQMA and LEZ.</p> <p>There will be a reduction of 600 tonnes of carbon and 9.2 tonnes of local air quality-related emissions (NO_x and PM_{2.5}) per annum as a result of this proposal.</p>
Grow and level up the economy.	<p>ZEBRA Programme Objective Support bus manufacturers in the development of zero emission bus technology.</p> <p>Wider DfT priorities Grow and level up the economy.</p> <p>Bus Service Improvement Plan To have a public transport network that is the first-choice mode for most journeys, for existing and new customers.</p>	<p>The zero emission bus routes serve areas with the highest deprivation and link employment and residential areas.</p> <p>A new UK-based manufacturer is proposed, who is working on new technology in BEV development, securing UK jobs, training and a strong skills base.</p> <p>Charging infrastructure, that is standard to most vehicles, would be available to other businesses for their BEVs. Reliable rapid energy resource. Charging available during the day when ZEBs are being used.</p>



Scheme Objective	Objectives and Priorities	How do the outcomes of the scheme meet the objective?
<p>Improve the travel experience for bus users (accessible buses / cleaner buses).</p>	<p>ZEBRA Programme Objective Support partnership working between Local Transport Authorities, bus operators, and other local stakeholders as set out in the NBS.</p> <p>Wider DfT priorities Improve transport for the user.</p> <p>Bus Service Improvement Plan To rebuild and increase passenger confidence.</p> <p>To have a public transport network that is the first-choice mode for most journeys, for existing and new customers</p>	<p>Bus users will experience a modern, high-quality, clean, quiet, fully-accessible bus, enhanced PSVAR, offering a step change in the quality of their journey.</p> <p>Improved real-time service information with disruption and punctuality alerts.</p>
<p>Ensure Norfolk is well placed to increase roll-out of zero emission buses in the future.</p>	<p>ZEBRA Programme Objective Support partnership working between Local Transport Authorities, bus operators, and other local stakeholders as set out in the national bus strategy.</p> <p>Understand better the challenges of introducing zero emission buses and supporting infrastructure to inform future Government support for ZEBs.</p> <p>Support the roll-out of the 4,000 Zero Emission Buses that the government committed to in Feb 2020.</p> <p>Wider DfT priorities Grow and level up the economy. Reduce environmental impacts / air quality. Improve transport for the user.</p> <p>Bus Service Improvement Plan To have a green and sustainable transport offer. To have a public transport network that is the first-choice mode for most journeys, for existing and new customers.</p>	<p>We have a strong working relationship with our bus operators through our engagement on the Voluntary Quality Partnership. This will form the basis of our Enhanced Partnerships and Norfolk BSIP going forwards – decarbonising our bus fleet will be central to this.</p> <p>All bus operators are committing to Enhanced Partnerships and zero emission targets and deliverables will be integrated within these partnerships and plans. We will remain in close dialogue with all other bus operators so that we are in a position to move forward together on joint funding / delivery of zero emission vehicles should financial and operational commitments change.</p>



- 8.6.2 How these objectives are expected to be delivered are described within a Theory of Change process (and logic map), describing the project outputs, project outcomes and strategic impacts.

8.7 Project Outputs

- 8.7.1 The following outputs as a result of the investment and resources (the inputs into the project) from the DfT, NCC, First Bus and the supply chain partners:

- The purchase of 15 single-decker electric buses, replacing 15 existing single-decker Euro 3 diesel buses, built to the highest passenger comfort, accessibility and quality standards,
- A power upgrade of the local electrical supply network at the First Bus depot, Norwich,
- Installation of electric bus charging infrastructure at the First Bus depot,
- Trained First Bus staff (bus drivers trained to operate the new electric vehicle buses and engineers / maintenance staff trained in the use of safe electric vehicle charging infrastructure and maintenance),
- The removal of 15 diesel Euro 3 buses from the First Bus fleet.

8.8 Project Outcomes

- 8.8.1 If the project is successful, a number of outcomes (the first order, immediate or short-term effects of the project) will be achieved:
- 8.8.2 CO₂ emissions within Norwich's AQMA and wider Norwich area served by the four bus line services (Green (15 / 15A / 15B), Yellow (29), Purple (39) and Charcoal (40, 40A) will be reduced by approximately 600 tonnes per annum as a result of the shift to zero vehicle emission buses (compared to the existing, heavily polluting, Euro 3 fleet). Similarly, NO_x emissions and particulates are reduced by approximately 9.2 tonnes over the same period.



- 8.8.3 Bus passengers on the four lines where the 15 electric bus vehicles will be placed in operation will experience enhanced levels of passenger comfort, journey quality and overall experience of bus travel compared to a counterfactual scenario with the existing Euro 3 fleet remain in operation. On board CCTV will increase feelings of safety and security, and audio announcement, and visual displays will indicate the next stop and ultimate destination, enhancing information provision. Given that vehicle emissions are experienced within vehicles as well as external to the vehicle, passengers will experience reduced exposure to pollutants, which harms health, whilst travelling.
- 8.8.4 The electric bus fleet purchased during the project are cheaper to maintain and more efficient to operate than their diesel counterparts. First Bus will therefore be able to use this lower cost base to re-invest in bus services, bus passenger quality and importantly the purchase of further electric vehicles – a Net Zero policy they are committed to in Norwich (and the UK). Such investment commitments form part of the complementary TCF project for Norwich.
- 8.8.5 Following the successful purchase of electric buses via the procurement process outlined within the Commercial Case, First Bus will possess a tried-and-tested procurement model to purchase further electric buses to help deliver greater electrification of their fleet. Any lessons learned will make subsequent procurement rounds more efficient. Similarly, the interaction, negotiation and agreement of contracts with the DNO, the process of obtaining planning consent for the infrastructure upgrades, and the procurement of design and electrical equipment for the bus charging infrastructure, will all provide a more efficient model to procure services and assets to 'roll-out' further electrification of the bus fleet in the future. The Norfolk BSIP sets out that building on our ZEBRA ambitions, NCC and bus operators wish to introduce 50 new zero emission buses in 2025/26, with a further 50 new zero emission buses the following year. Lessons learnt



through the ZEBRA application process will be transferable to deliver this BSIP commitment with other bus operators.

8.8.6 First Bus employees will need to be trained to operate the new electric buses, and engineers and maintenance staff will similarly require training to maintain and operate the charging infrastructure, so the project will deliver increased skills to the workforce in a 'green industry', an aspiration of the government's Ten Point Plan and Net Zero Strategy.

8.8.7 REDACTED

8.9 Project Impacts

8.9.1 The project's second order, strategic impacts, which are predicted to occur over a longer time period, and which cover economic, social and environmental improvements are described below. These align closely with the project objectives.

8.9.2 **Transport will be improved for the user** – the passenger comfort, journey experience and satisfaction levels experienced by passengers will, according to economic theory, reduce generalised costs of travelling by buses (on these services noted above), particularly relative to the counterfactual where there is no change to the bus fleet, and relative to other modes. Alongside further investment in buses, in line with Norfolk's BSIP, the TCF Programme, and future sustainable and public transport funds and programmes, which include bus priority and provision of additional services, this will lead to increased bus patronage and mode share for bus in Norwich.

8.9.3 **Reduced environmental impacts** – the project will deliver a greener bus fleet in Norwich and will contribute to NCC's target set out in the Norfolk BSIP to have 50% of the buses in operation in Norfolk by 2027 being 'green buses' (i.e. electric or hydrogen propelled). The increased confidence in the electric bus market, together with the tried-and-tested procurement model for buses and infrastructure upgrade is likely to accelerate the shift to further bus fleet



electrification as the green bus market matures. This will subsequently accelerate decarbonisation and reduce environmental impacts attributed to bus operations. This project, and associated, complementary projects and programmes such as TCF also contribute to the government's and NCC's Carbon Net Zero targets, and directly to the commitment to 'roll-out' 4,000 zero emission buses as part of the ZEBRA programme.

- 8.9.4 **Rebalanced economy (Levelled Up)** – As described in Section 5, Norwich performs poorly across a range of socio-economic metrics both regionally and nationally, and as demonstrated through the use of the DfT's forthcoming Levelling Up toolkit, which incorporates place-based analysis, is deemed to be a place in need of Levelling Up. This project can help to Level Up Norwich via mechanisms also described above.
- 8.9.5 REDACTED. Investment in training by First Bus in its drivers and maintenance engineers in the new technology enhances skills within the industry, with skills training another known driver of improving productivity and Levelling Up.
- 8.9.6 The government recently committed to “transform and improve healthcare outcomes for people” in the ‘Autumn Budget and Spending Review’³, 2021), with health outcomes a key part of its Levelling Up agenda, which aims to reduce regional inequalities. This project, by removing 600 tonnes of carbon and 9.2 tonnes of NO_x emissions and particulate matter from the atmosphere per annum, will directly improve air quality, and subsequently the health of the population of Norwich exposed to this pollution. This population also happens to be some of the most economically deprived within Norwich (see **Figure 7**), therefore the project has the potential to Level Up health outcomes for those most in need within Norwich. This project, alongside other projects and programmes, such as TCF, implementation of the Norfolk BSIP proposals and future bus investment funding, supports bus

³ [Autumn Budget and Spending Review 2021: documents - GOV.UK \(www.gov.uk\)](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/97821/Autumn_Budget_and_Spending_Review_2021_documents.pdf)



electrification, modal shift and the improvement of air quality in Norwich, and the health outcomes of the population.

9 Theory of Change - Logic model

- 9.1.1 A Theory of Change logic model, which encapsulates the narrative described above, is shown in **Figure 10**. It provides an illustrative overview of the inputs and activities of the project which deliver the project outputs. These in turn translate into the outcomes and subsequent strategic impacts.



FIGURE 10: LOGIC MODEL

The logic model has been redacted.



10 Monitoring and Evaluation

- 10.1.1 Effective monitoring and evaluation (M&E) is an important part of the overall appraisal process and we will deliver a tailored monitoring and evaluation programme that identifies the extent to which the identified objectives and anticipated outcomes have been achieved.
- 10.1.2 Full details of the monitoring and evaluation we will undertake are set out in the separate M&E report.
- 10.1.3 Should DfT procure an external research contractor to coordinate M&E across the ZEBRA programme, the Norfolk M&E will fully support this and provide the necessary data as and when required.

11 Alignment with wider transport strategy / policy

- 11.1.1 Complementary local investment in bus priority
- 11.1.2 Many of the proposals being delivered through the current £32m TCF programme in Norwich are complementary to the roll-out of high-quality, zero emission buses, enhancing the public transport network and facilitating modal shift from private car. Complementary proposals in the TCF programme are as follows:
 - Nearly 5km of new dedicated bus lanes,
 - Removal of pinch points on the network,
 - Traffic signal priority for all buses at all signalised junctions in Greater Norwich that are on the bus network.

How ZEBRA interlinks:

- We have strong evidence to show that bus priority measures are reducing bus journey times and improving journey-time reliability in



Norwich. This will maximise the efficiency of bus operations and range of electric buses

- The high-quality electric buses raise the standard of the public transport 'offer' in Norwich, which, coupled with improved journey times and service reliability, will rebuild and increase passenger confidence to offer public transport network that is the first-choice mode for most journeys.

11.2 Complementary investment by First Bus

- 11.2.1 Through the delivery of the TCF programme in Greater Norwich, First Bus has committed to investment of £18m in the delivery of new and refurbished buses in Norwich, as well as the roll-out of next-stop audio and visual announcements on all buses, as well as service frequency enhancements.

How ZEBRA interlinks:

- In addition to the match funding First Bus are providing for the Norfolk ZEBRA application, they have made a clear commitment to identify appropriate opportunities to invest in zero emission vehicles in Norwich.
- The ZEBRA programme provides the opportunity to act as a springboard for further deployment of zero emission buses in Norwich using this complementary funding.

11.3 Air Quality Action Plan (AQAP)

- 11.3.1 Many of the measures outlined in the Norwich City Council 2020 AQAP are ongoing or are programmed for implementation. A recent review (June 2021) of the AQAP by the City Council approved:
- Expansion of the LEZ in Norwich,
 - Tougher restrictions on emissions standards within the LEZ,
 - Promotion of low emission public transport through grant applications.



How ZEBRA interlinks:

- The introduction of zero emission buses reinforces the introduction of tougher restrictions on emissions standards in Norwich. This ZEBRA funding application is fully consistent with the City Council approval to promote low emission public transport through grant applications.

11.4 Alignment with national / regional / local transport strategies

DfT's Transport Decarbonisation Plan

- 11.4.1 'Decarbonising Transport: A Better, Greener Britain' published by the DfT in June 2021 sets out a bold vision for reducing the impact of travel and transport on our local and global environments. It recognises the challenges and dangers of continued growth in car use and advocates that making "public transport, cycling and walking the natural first choice for all who can take it".

How ZEBRA interlinks:

- This ZEBRA application fully supports the decarbonisation strategy that the bus must play its part in an environmental transformation of our transport network.
- This proposal removes 600 tonnes of carbon per annum.

Bus Back Better

- 11.4.2 'Bus Back Better: A National Bus Strategy for England' published in March 2021 forms the cornerstone of our plans for buses in Norfolk, which is structured around the key challenges of ensuring that buses experience a renaissance in quality and use.

How ZEBRA interlinks:

- The Norfolk BSIP and Enhanced Partnership have been developed in response to the Bus Back Better strategy. The strong linkages



between the Norfolk BSIP and Norfolk ZEBRA proposals are outlined in this document.

Spending Review 2020: Provisional Priority outcomes and metrics

11.4.3 DfT priorities outlined in this are:

- Improve connectivity across the United Kingdom and grow the economy by enhancing the transport network on time and on budget,
- Tackle climate change and improve air quality by decarbonising transport,
- Build confidence in the transport network as the country recovers from COVID-19 and improve transport users' experience, ensuring that the network is safe, reliable, and inclusive.

How ZEBRA interlinks:

- The linkages between ZEBRA and the DfT priorities are outlined in this document.

Transport East

11.4.4 We work closely with Transport East, who has outlined in its "[Decarbonisation Evidence Base and Strategic Recommendations Report \(Nov 2020\)](#)" that public transport and active transport is a key area to focus on in order to support the reduction in carbon emissions across transport".

How ZEBRA interlinks:

- The Norfolk ZEBRA proposal will reduce carbon emissions by at least 600 tonnes per annum, as well as reducing 9.2 tonnes of local air quality-related emissions.

Local Enterprise Partnership 2021 Delivery Plan



11.4.5 The New Anglia Local Enterprise Partnership (LEP) 2021 Delivery Plan clearly sets out Norfolk and Suffolk as being the UK's Clean Growth Region, at the forefront of tackling the challenges and opportunities of climate change. Supportive of this proposal for zero emission buses, the LEP, working with NCC and other stakeholders has the aim of delivering the following through the Delivery Plan:

- Facilitating the development of a Decarbonisation Academy, supporting the development and transition of the skilled workforce required,
- Mapping how existing jobs need to evolve and the new jobs required to support and develop a workforce required for the Green Industrial Revolution,
- Exploring the opportunities of a regional decarbonisation investment bank that would support unlocking clean growth investments,
- Mapping out the key investments that will support the development of a clean growth workforce and sustainable economy,
- Working with regional partners to develop an alternative fuels strategy which will support the move to the decarbonisation of transport.

How ZEBRA interlinks:

- A successful ZEBRA application in Norfolk will 'open the door' to working closely with the New Anglia LEP on the key elements of their delivery plan outlined above, particularly around working with regional partners and seeking investment for further decarbonisation.

NCC Environmental Policy

11.4.6 NCC is committed to decarbonising transport and adopted a new [Environmental Policy](#) in 2019, which sets out to achieve 'net zero' carbon emissions on our estates by 2030, but within our wider areas, work towards 'carbon neutrality' also by 2030. Key elements of this policy are:



- Supporting the creation of green infrastructure in our key urban areas.
- Supporting alternatives to car travel.
- Encouraging sustainable travel on all new developments.
- Supporting initiatives that lead to clean air, such as developing new proposals within the forthcoming [Local Transport Plan](#) (LTP).

How ZEBRA interlinks:

- ZEBRA is fully aligned with the environmental policy in terms of supporting green infrastructure and supporting alternatives to car travel.

Local Transport Plan

- 11.4.7 A key objective of our new draft LTP is “to improve the health of our residents by improving air quality and encouraging active travel options to improve health and fitness and also helping reduce our greenhouse gas”. Carbon reduction commitments will be clearly defined.

How ZEBRA interlinks:

- The Norfolk ZEBRA application is fully aligned with the new Local Transport Plan in terms of reducing carbon emissions (600 tonnes/yr) and air quality related emissions (9.2 tonnes/yr).

Transport for Norwich Strategy

- 11.4.8 We have recently reviewed and renewed our Transport for Norwich Strategy, which was consulted on during Summer 2021 and was adopted December 2021. Our vision is that Norwich is a place where carbon emissions from transport are reduced. After devising a carbon budget for surface transport, a baseline will be set, and we will use this to assess potential interventions. Monitoring the efficacy of interventions using the carbon budget will guide further delivery.



How ZEBRA interlinks:

- The Norfolk ZEBRA application is fully aligned with the new Transport for Norwich Strategy in terms of reducing carbon emissions (600 tonnes/yr) and air quality-related emissions (9.2 tonnes/yr).

Norfolk Strategic Infrastructure Delivery Plan (NSIDP)

11.4.9 At a more local level, the NSIDP sets out the ambitions of the area to focus on sustainable energy generation and significant investment in transport to improve the connectivity of the region and ensure labour markets and supply chains are protected. The County Council aims to support local partners to invest in energy and water efficiency, storage, and management infrastructure. Economic opportunities will arise from:

- Delivering an integrated approach to infrastructure and inter-regional connectivity to maximise clean growth.
- Developing exemplar low carbon energy generation, networks and storage which benefit local businesses and communities

How ZEBRA interlinks:

- The ZEBRA project provides the opportunity to engage with local partners on energy storage and management as part of lessons learnt through project delivery. This could then form the basis of future electric bus roll-out.

11.5 Alignment with behaviour change programmes

11.5.1 In terms of wider proposals to increase active travel, NCC is committed to the delivery of a co-ordinated and sustained behaviour change programme to encourage the use of more sustainable modes of transport. This is being rolled out during 2020/21 through funding from the Access Fund and Active Travel Fund.



12 Summary of Strategic Case

- 12.1.1 This Strategic case has set out the case for change and demonstrated how the Norfolk ZEBRA proposal achieves the objectives of the ZEBRA scheme, provides strategic fit with Government and DfT priorities, and is strongly complementary to other projects, programmes and initiatives being pursued by NCC, local bus operators and stakeholders, particularly our new Norfolk BSIP, which sets out our joint aspiration to transition to a zero emission bus fleet.
- 12.1.2 15 battery-powered single-decker electric buses will reduce environmental impacts and improve air quality by operating through the most polluted areas of Norwich, which includes the LEZ and AQMA in the city centre, reducing carbon emission by 600 tonnes, as well as 9.2 tonnes of local air quality-related emissions of NO_x and PM_{2.5} per annum. The bus routes that will benefit from new zero emission buses also operate through areas of high multiple deprivation and link these areas with appropriate employment, training and education at edge of city industrial estates, business parks and the city centre itself. Complementary investment in bus infrastructure in Norwich through our TCF programme is already delivering faster and more reliable journey times for bus users, which will only increase further as our TCF programme nears completion in 2023.
- 12.1.3 Our ZEBRA proposal will improve transport for the user by delivering a step change in the transport user experience through the provision of modern, comfortable, accessible and safe buses that provide visual and audible information. These attributes are consistent with outcomes outlined in our Norfolk BSIP and a successful award of ZEBRA funding would enable our Norfolk BSIP to 'hit the ground running' and establish a firm foundation to build upon. This would give Norfolk a head-start in terms of better understanding the challenges of introducing zero emission buses and supporting infrastructure to inform future government support for future roll-out, one of the ZEBRA programme objectives.



- 12.1.4 The Norfolk ZEBRA proposal delivers strongly against assessment criteria considered by Government in terms of support through 'Levelling Up', which include deliverability, strategic fit with local and Government priorities and value for money.

13 Annex

- 13.1.1 All Appendices can be found in a separate Appendices document.

14 Glossary of Abbreviations and Defined Terms

- **AQAP** - Air Quality Action Plan
- **AQMA** - Air Quality Management Area
- **BCR** - Benefit Cost Ratio
- **BEV** - Battery Electric vehicle
- **BID** - Business Improvement District
- **BSIP** - Bus Service Improvement Plan
- **BSOG** - Bus Service Operator Grant
- **CO2** - Carbon Dioxide
- **CSS** - Combined Charging System
- **CYC** - City of York Council
- **DEFRA** - Department for Environment, Food and Rural Affairs
- **DfT** - Department for Transport
- **DNO** - Distribution Network Operator
- **EOI** - Expression of Interest
- **EQIA** - Equality Impact Assessment
- **EV** - Electric Vehicle



- **GBT** - Greener Bus Tool
- **GDP** - Gross Domestic Product
- **GJT** - Generalised Journey Time
- **GNR** - Greater Norwich Region
- **ICE** - Internal Combustion Engine
- **ITT** - Invitation to Tender
- **JCS** - Joint Core Strategy
- **LED** - Light-Emitting Diode
- **LEP** - Local Enterprise Partnership
- **LEZ** - Low Emission Zone
- **LTA** - Local Transport Authority
- **LTP** - Local Transport Plan
- **M&E** - Monitoring and Evaluation
- **NBS** - National Bus Strategy
- **NCC** - Norfolk County Council
- **NNUH** - Norfolk and Norwich University Hospital
- **NO₂** - Nitrogen Dioxide
- **NO_x** - Oxides of Nitrogen
- **NRP** - Norwich Research Park
- **NSIDP** - Norfolk Strategic Infrastructure Delivery Plan
- **OEM** - Original Equipment Manufacturer
- **OfGEM** - Office of Gas and Electricity Markets
- **ONS** - Office of National Statistics
- **PIPs** - Punctuality Improvement Partnerships



- **PM10** - Particulate Matter
- **PM2.5** - Particulate Matter to 2.5 microns
- **PSVAR** - Public Service Vehicles Accessibility Regulations
- **PVB** - Present Value of Benefits
- **PVR** - Peak Vehicle Requirement
- **R&D** - Research and Development
- **SCRT** - Selective Catalytic Reduction Technology
- **SLA** - Service Level Agreement
- **SRO** - Senior Responsible Owner
- **SSE** - Scottish and Southern Elect
- **TAG** - Transport Analysis Guidance
- **TCA** - Trade Cooperation Agreement
- **TCF** - Transforming Cities Fund
- **TfN** - Transport for Norwich
- **ToR** - Terms of Reference
- **UEA** - University of East Anglia
- **UKPN** - UK Power Networks
- **VfM** - Value for Money
- **VQP** - Voluntary Quality Partnership
- **WHO** - World Health Organisation
- **ZEB** - Zero Emission Bus
- **ZEBs** - Zero Emission Buses

