City of Wolverhampton Council

Wolverhampton Net Zero Neighbourhood

Demonstrator Plan for Graiseley

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1. Contents

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1. Executive Summary

The ambition for the West Midlands is to become a net zero carbon economy by 2041. This will only happen through a combination of strategic top-down interventions and grass roots and localised actions, strengthened by a committed partnership, clear route map and accelerated delivery. The Net Zero Neighbourhood programme is pivotal in effecting decarbonisation at a local level, through scalable, community-endorsed interventions. This is not just another capital programme. This programme will drive transformation and raise awareness of the importance of decarbonisation, net zero and the responsibilities shared by everyone.

This proposal sets out Wolverhampton City Council's ambition for the area of Graiseley, south west of the city centre. Like many neighbourhoods in the West Midlands, the area is in need of investment but has many key strengths and assets particularly it's green and public space and importantly, its community. There are rich connections within the neighbourhood and a number of active local organisations that together, drive and emulate that sense of community, creating the conditions for a better quality of life for its residents.

Graiseley was chosen as the pilot area as it has an urban fabric that will benefit from different measures and will be able to achieve significant decarbonisation measures with the right interventions, to move the 21.5 $ktCO_2e$ towards Net Zero. It also is quite a varied neighbourhood with different uses, qualities and types of housing which can demonstrate the greatest variety of concepts from the wider strategic neighbourhood plan.

There has been a considerable amount of work completed, reflected in Sections 1 – 4, to select the right neighbourhood, the right approach and create the right baseline for the delivery of the programme. Section 5 introduces the street level demonstrator with Sections 6 – 8 setting out the proposed programme and approach including the key principles of community engagement which underpins the delivery and is fundamental to the programme's sustainability. The methods to drive success are summarised in Section 7.

We have developed a comprehensive plan that outlines actions under the following sectoral strategies:

- Implementing community retrofit and energy interventions at scale,
- Providing the enabling infrastructure for electric mobility,
- Supporting a mode shift to active mobility, through the provision of a safe, high quality public realm,
- Delivering heathier and greener public spaces,
- Trialling flagship initiatives to encourage the uptake of circular economy practices

The long-list of projects prioritises avoiding the production of new emissions, and the reduction of existing ones, but also offers measures to convert existing energy sources and deliver local carbon removal through nature-based solutions. These benefits will be felt by more than 700 residents in the demonstrator area, with almost 130 homes receiving direct and immediately quantifiable benefits. Utilising £1.2m from WMCA's fund, these 130 homes will see a 212.4tCO_2e reduction, with an average yearly bill saving of £700 for deep retrofit and £485 for targeted retrofit measures, per dwelling.

Community engagement initiatives underpin each sectoral portfolio of projects and their supply chain. These are a crucial element to ensure the success and sustainability of the demonstrator, and include consultation, training and co-creation and production. Community engagement will also play a substantial role in helping tackle consumption-based emissions through behaviour change, while engagement with the local supply chain will help reduce embodied emissions in capital project such as housing retrofit.

The plan envisages the development of activities that will enable the scaling up of the demonstrator, both from a technical and financial perspective, enabled by delivery partners and supported by the community. The development of a data-driven approach to monitoring and evaluation will help prove the effectiveness of the pilot projects, evidenced with KPIs across economic, environmental, programme, overarching benefits and, importantly, social categories. Examples include reduction in deprivation, increase in market value and overall satisfaction of retrofit measures. The plan has been designed to rapidly realise these benefits through maximising internal resource, partnerships and contracts to speed up delivery.

We acknowledge that there is a level of uncertainty, and this is a proposal at this stage which requires more engagement with different partners, however, we are confident that this plan provides an evidence-based, robust framework for delivery that can withstand changes in conditions and produce the desired outcomes.

2. Introduction

2.1 This report

This report has been prepared by Arup on behalf of City of Wolverhampton Council (CWC) in response to the West Midlands Combined Authority's (WMCA) invitation to join a partnership to develop the future of neighbourhoods in the West Midlands. The Net Zero Neighbourhood Plan consists of understanding of the selected neighbourhood, the Capital Investment, Project Delivery and Community Engagement Plans.

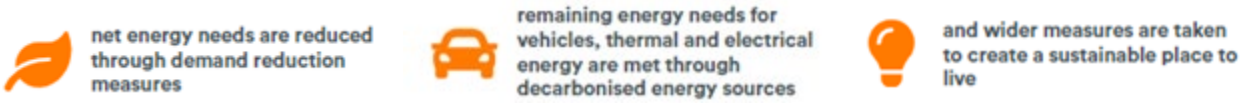
2.2 Background and the Net Zero Neighbourhood Demonstrator Programme

In November 2021, the WMCA launched its Net Zero Neighbourhood (NZN) Demonstrator Programme, to identify a small cohort of neighbourhoods across the West Midlands area where new approaches to creating low carbon communities can be explored.

To date, initiatives designed to encourage individual households to take up deep retrofit and cleaner heating technologies have not generated change at the necessary scale or pace. The costs and disruption caused by making changes to individual homes currently outweigh the short and medium-term benefits. The WMCA made a rallying call for a different approach.

The programme has been established by the WMCA as one part of its strategy to cut regional carbon emissions to net zero by 2041. The *#WM2041* strategy and its associated *Five-Year Plan* shows that the area needs to retrofit nearly 300,000 homes by 2026 to meet the targets. The NZN Demonstrator aims to take a place-based approach to decarbonisation to evidence a scalable investment case for systemic, rather than piecemeal, interventions.

The WMCAs definition of a NZN is a community where:



The programme is not seen as a competition, and a cohort approach will mean that lessons learned in one neighbourhood can be replicated and scaled in others. For those plans that are not successful in the initial tranche of funding available, the WMCA will work with the area to find funding and finance opportunities to deliver the plan.

In 2022, the WMCA opened the programme to expressions of interest, and Graiseley in Wolverhampton was selected, alongside other neighbourhoods in the West Midlands. The WMCA have made £1.65 million available to fund the first phase of the NZN, with the requirement for Delivery Plans to be submitted by the 6th July 2022. It also required the Delivery Plan to include an understanding of local area, a capital investment plan, a project delivery plan and community engagement plan.

2.3 Main Project Acronyms

CWC	City of Wolverhampton Council
DNO	Distribution Network Operators
EPC	Energy Performance Certificate
ESG	Environmental Social Governance
NZN	Net Zero Neighbourhood, also referred to NZ Net Zero
SUD	Sustainable Urban Drainage
WMCA	West Midlands Combined Authority
SAP	Standard Assessment Procedure (calculation methodology for energy use in dwelling)

3. Vision and objectives

3.1 Why Graiseley

Graiseley is a dense urban neighbourhood south-west of the Wolverhampton city centre. Most of the Ward is residential, with over 5,000[1] households within distinct character areas. A historic industrial cluster, including commercial and retail uses, are located to the east of the Ward, close to the A4150, Chapel Ash and A449 Penn Road, including a large Sainsbury's store. There are pockets of green spaces and other community services located throughout the area. Further details about the Local Area are set out in Section 4.

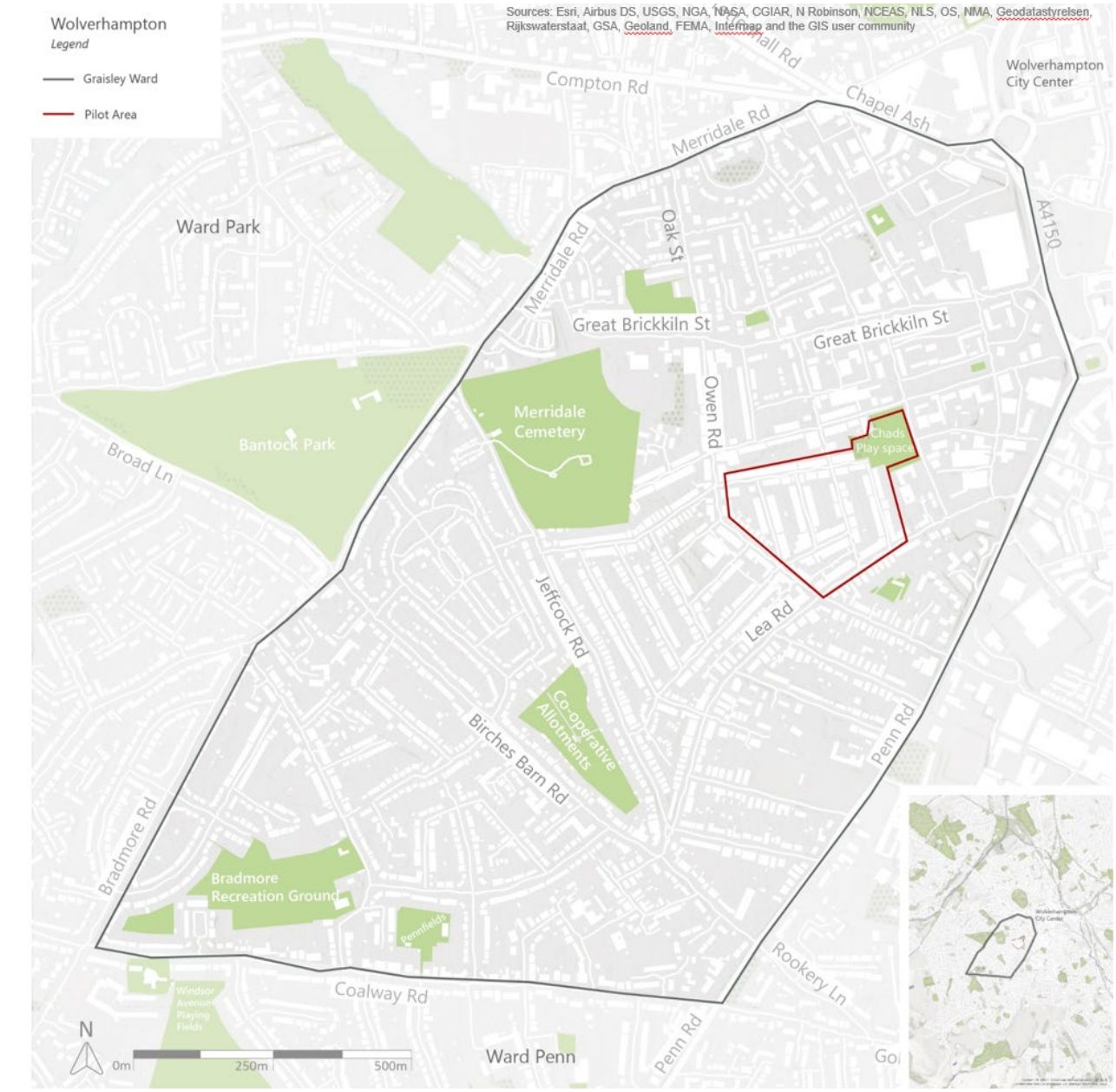
Graiseley is the perfect pilot area for this demonstrator for the following reasons:

- It needs positive intervention, with large areas of Graiseley listed in the 10% most deprived areas nationally and above the average for the city
- The area responds to the WMCA's criteria as it ranks highly on the combined scores of fuel poverty, and rate of low Energy Performance Certificate (EPC) properties in Wolverhampton.
- Its diversity of place and people is a strength allowing a broad range of interventions to be trailed at scale with different communities, and to demonstrate ways to overcome challenges to delivering at pace.
- The delivery of NZNs in Wolverhampton aligns with the City's strategic ambitions to be at the epicentre of the Levelling Up agenda with Government, the UK's National Centre for Sustainable Construction and a key partner in the West Midland's 3 Cities Retrofit Initiative with Birmingham and Coventry to accelerate green growth and address decarbonisation.

Figure 1: Wards within Wolverhampton

[1] Census 2011 was 5,171 households (https://www.wolverhampton.gov.uk/sites/default/files/pdf/All_Areas.pdf0 and Parity Projects 2022 has 5644 householders now in the area

Figure 2: Graiseley Ward and Street-Level Demonstrator Area



3.2 Vision

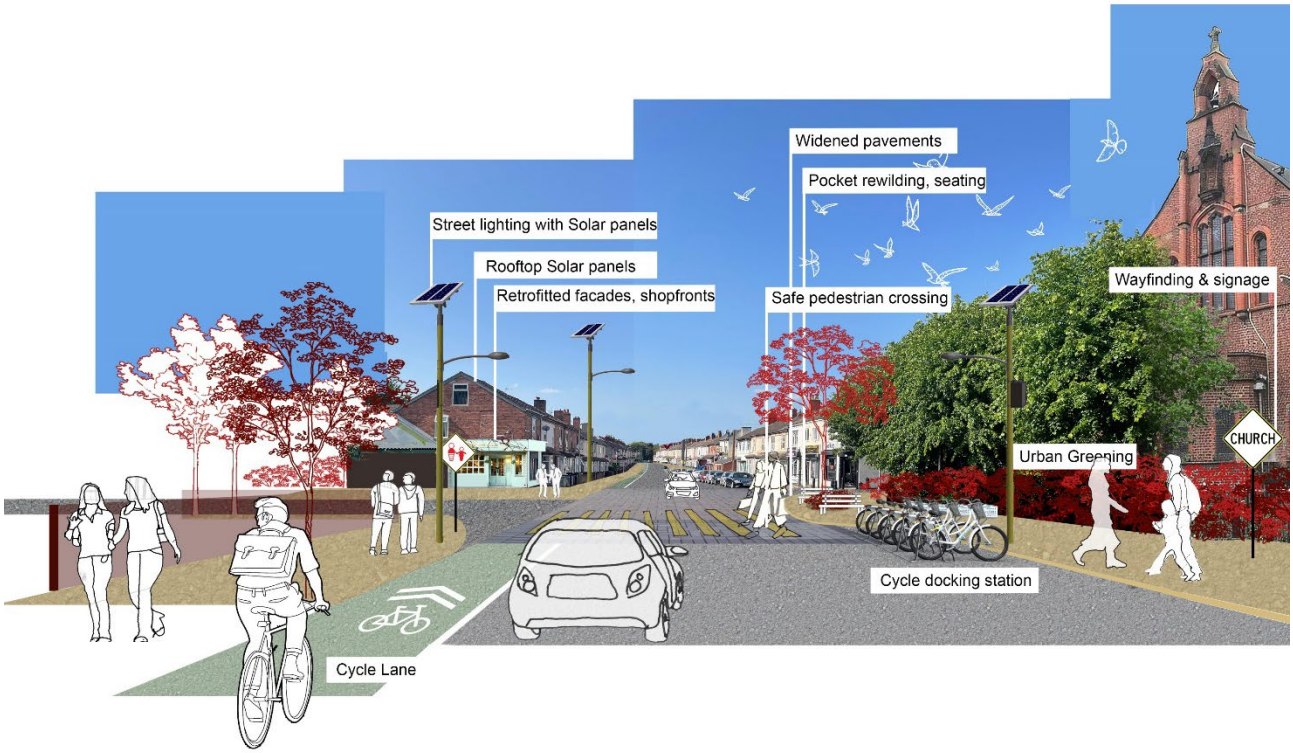
To make the Graiseley net zero neighbourhood a healthy, inclusive, resilient and sustainable place to live, being an exemplar for the delivery of net zero neighbourhoods in other Wolverhampton communities, the West Midlands and across the UK

3.3 Desired outcomes and principles

Underpinning this vision will be a series of key outcomes for the community and the city, which are also aligned to key principles from the CWC Our City Our Plan to show how the city is climate conscious, driven by digital and fair and equal. These measures are the critical success factors for the programme, as set out by the WMCA, and will form the basis of the performance management framework and confirmed with the local community:

- The community in Graiseley is empowered to contribute to and take ownership of changes they want to see in their neighbourhood and feels supported by CWC.
- Overall energy use and generation is balanced within the neighbourhood, and contributes to net zero carbon by 2041 for Wolverhampton
- There are no homes with an EPC rating worse than SAP Rating C (SAP 69+), resulting in reduced bills, fewer homes in fuel poverty and improved health.
- An improvement in environmental quality and feelings of safety moving around the neighbourhood, where essential goods and services are in easy reach and active travel is more attractive than using a car, lead to increase levels of physical activity and wider health benefits.
- An overall reduction in deprivation in Graiseley, with particular improvements to outcomes in health and access to jobs and skills.
- Graiseley becomes a community where people are proud to say they live and want to stay long term, making it an investable place for residents, landlords and CWC.
- More people from Graiseley and the whole city are accessing jobs in green industries, particularly driven by the national centre for sustainable construction and the city's Green Innovation Corridor.
- A stronger supply chain with clusters of expertise across Wolverhampton and the West Midlands, using innovation and modern data management techniques to support the scaling up of net zero neighbourhoods to the wider are.

Figure 3: Street collage showing potential net zero interventions



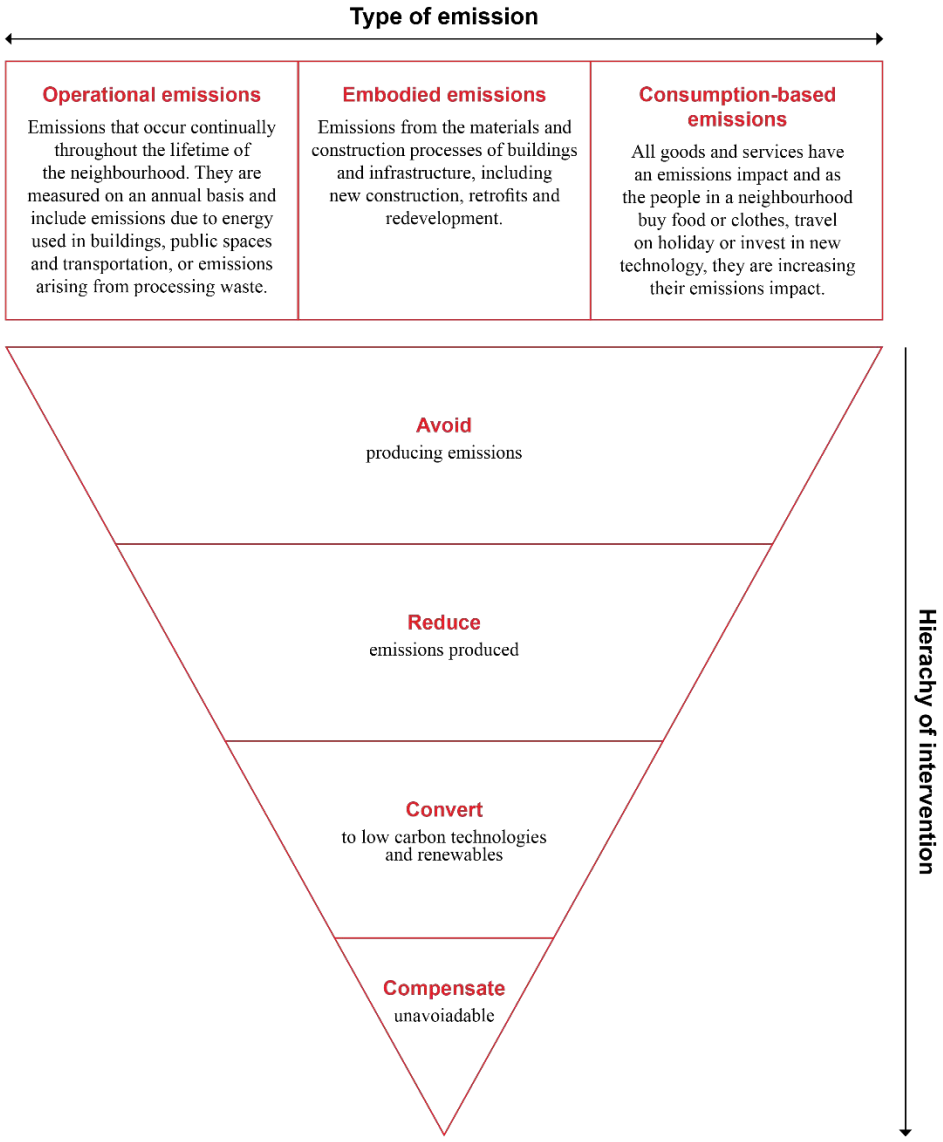
3.4 Approach to Net Zero

Achieving Net Zero Emissions will require a coordinated approach in tackling operational, embodied and consumption-based emissions in the short, medium, and long term.

In 2021, Arup and C40 Cities developed the "Green and Thriving Neighbourhoods" guidebook, which addresses the transition to net zero in new and existing neighbourhoods. Through a people-centred approach, the resource provides a comprehensive set of strategies that span from promoting clean construction practices, to reducing physical and digital segregation, to supporting the creation of green jobs, leaving no one behind. The framework below, adapted from the guidance, illustrates the importance of designing a holistic set of strategies that address every type of emission. The other dimension of the diagram sets a hierarchy of intervention, which prioritises initiatives preventing the generation of any additional emission, and interventions that reduce any emissions produced.

The Graiseley NZN has the potential to demonstrate the impact of acting across both dimensions of the framework, from reducing energy consumption of domestic buildings, changing patterns of consumption, to compensating residual emissions by increasing the provision of green infrastructure.

Figure 4: Net Zero Framework (Adapted from C40 & Arup Green and Thriving Neighbourhoods)



4. Understanding the Local Area

4.1 City-wide policies and plans

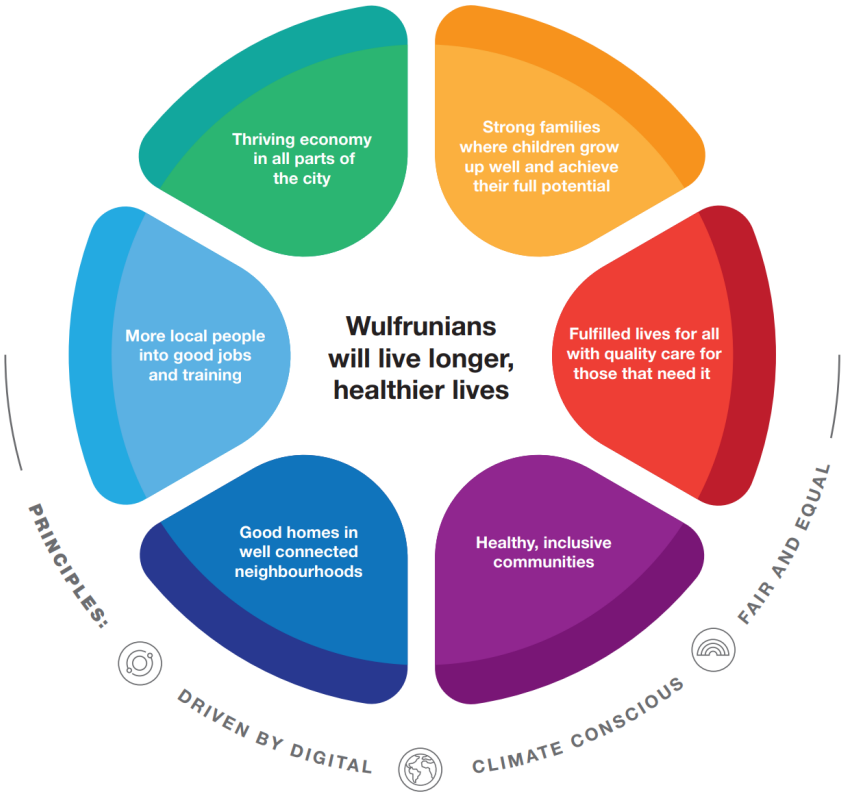
Summary of key findings and conclusions

- Wolverhampton has clear policies and plans in place that commit the city towards net zero carbon. With its action plan in place for the CWC, and one under development for the rest of the city, the institutional change required is starting to happen, with actions prioritised in decision making.
- The city is aligned with wider partners including the WMCA and the 3 Cities to deliver net zero change and developments, taking a scaled-up approach to secure wider investment and buy-in.
- With the establishment of the National Brownfield Institute and the National Centre for Sustainable Construction concept, the CWC is working with partners to put supply chain and skills development as part of its modern economy to drive forward change and development
- Other than the parts of the Ward close to the city centre, Graiseley is not identified as an area of major growth, indicating that the focus of net zero carbon should be on retrofit and repurposing of existing buildings and the continued protection of green infrastructure.

4.1.1 City of Wolverhampton 'Our City: Our Plan'

In 2022, the CWC refreshed its Council Plan with 'Our City: Our Plan'[2] which sets out six overarching priorities to support the 2030 vision - "Wulfrunians will live longer, healthier and more fulfilling lives".

Figure 5: Extract from Wolverhampton Our City: Our Plan setting out priorities and principles



[2] https://www.wolverhampton.gov.uk/your-council/our-city-our-plan

The six priorities are aligned with the CWCs climate change strategy and "Climate conscious" is one of the cross-cutting principles embedded in this approach to strengthen the city's commitment to address the climate emergency. Specific actions included in the plan relevant to net zero transition include:

- reducing fuel poverty and improve the thermal efficiency of homes.
- investing in parks and green spaces, including planting 20,000 new trees over the next two years.
- investing in retrofit programmes and building new homes as per maximum possible energy efficiency standards with plans to deliver 1,000 new low carbon homes by 2024.
- switching all 30,000 streetlights to LED lighting with smart sensors by end of 2022 to save 4,000 tonnes of carbon per annum.
- encouraging active travel, maximising the use of open spaces and investing £4 million to launch the 'Healthier, Happier Active City' and a 'Kids Get Active' programme by 2024.
- Other initiatives include investing in sustainable transport infrastructure, improving public transport, sourcing more goods and services locally, creating new skilled jobs in the green economy and embedding low carbon practices within procurement and other services.

4.1.2 Climate emergency plans

CWC declared a 'climate emergency' in July 2019. To support national efforts to combat climate change, CWC is committed to reducing its own carbon emissions by 95% by 2028 and has set the target of achieving the same results for the city by 2041, in line with the WMCA #WM2041 strategy.

According to the Tyndall Centre's carbon budget report[3], the city would need to reduce its GHG emissions from 900,000 tonnes a year to 45,000 tonnes by 2041, at a rate of 12% every year. Based on current emissions, the city will use its entire carbon budget within the next five years.

In Wolverhampton alone, the city needs to retrofit over 100 homes every week between now and 2041 to meet net zero targets. In addition, the Black Country Ultra Low Emission Vehicle Strategy identifies the need to electrify 110,000 registered vehicles and prevent the growth of the private vehicle use particularly through improved public transport and active travel infrastructure.

Within the built environment and energy section of the climate change action plan for CWC actions, there are commitments relevant to NZN, specifically:

- All future corporate schemes (refurbishments / new builds) should be built to BREEAM Excellent Standard as default, and encourage educational institutions to do the same
- All future corporate schemes (refurbishments / new builds) should, where possible, be delivered to maximum energy efficiency performance rating with ambition to be Zero Carbon where practical.
- Implement and expand the district heating network for city centre and outlying areas to support heating decarbonisation.

Improving the quality and thermal efficiency of homes and reducing fuel poverty is also part of the Housing Strategy for Wolverhampton[4].

4.1.3 Development plans

The Local Plan for Wolverhampton comprises several Development Plan Documents, with the ones most relevant to Graiseley Ward being:

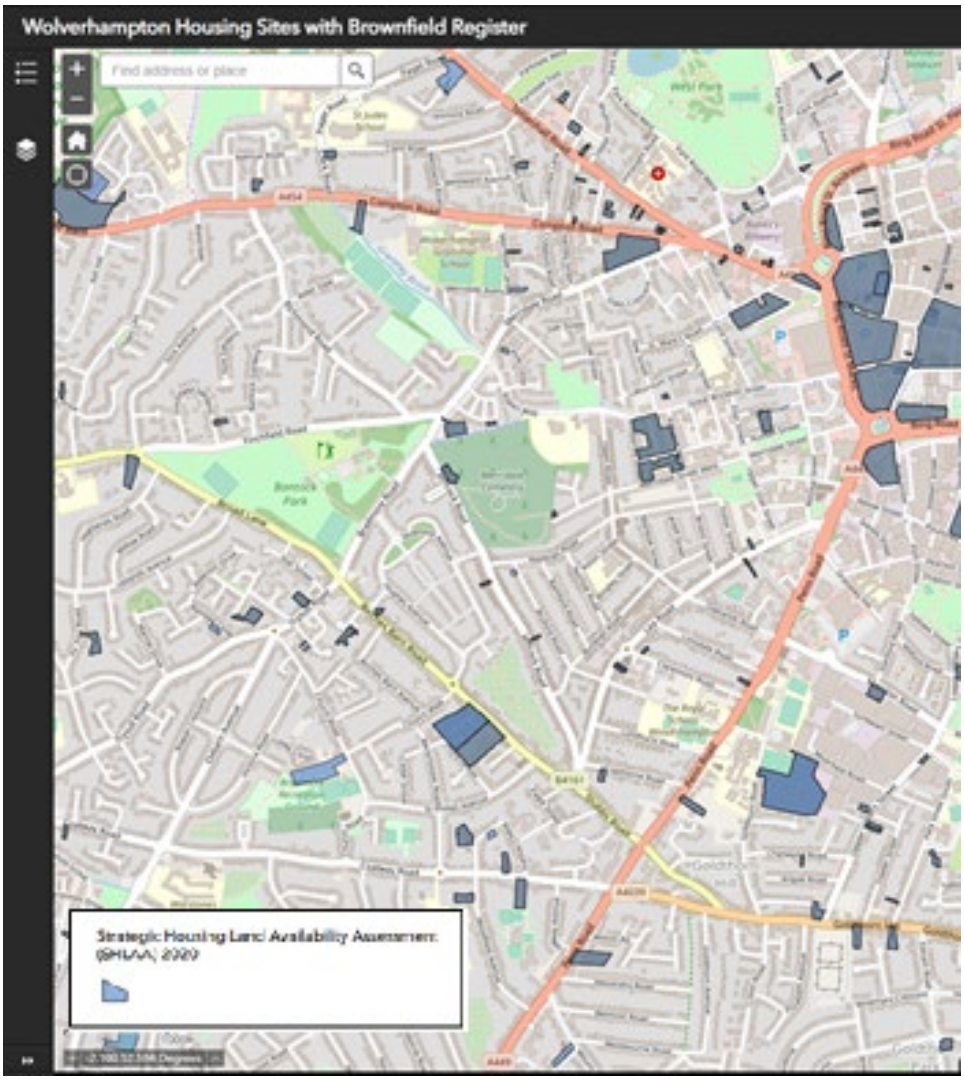
- Black Country Core Strategy (BCCS)[5] – adopted 2011 (to be replaced by the Black Country Plan)
- Wolverhampton City Centre Area Action Plan (AAP)[6] – adopted 2016 (see Figure A1.1)

These plans include a number of policies to make Wolverhampton more sustainable, including the protection of environmental infrastructure (Policy CC10 of the AAP) and requiring new developments to have renewable energy (Policy ENV7 of the BCCS). Whilst the north-east part of the Ward overlaps with the City Centre regeneration area, Graiseley is not currently identified for major redevelopment proposals. Certain

[3] https://carbonbudget.manchester.ac.uk/reports/E08000031/
[4] https://wolverhampton.moderngov.co.uk/documents/s128144/Appendix%201%20for%20City%20Housing%20Strategy%202019%20-%202024.pdf
[5] https://www.wolverhampton.gov.uk/planning/planning-policies/black-country-core-strategy
[6] https://www.wolverhampton.gov.uk/planning/planning-policies/area-action-plans-aaps

sites are identified for housing development in the Strategic Housing Land Availability Assessment (2020)[7], including sites with planning permission, other opportunities and those recently completed.

Figure 6: Extract from Wolverhampton Strategic Housing Land Availability Assessment (2020) for Graiseley Ward



4.1.4 National Centre for Sustainable Construction

CWC, working alongside the University of Wolverhampton, Black County LEP and WMCA, have been developing a place-based vision for the city to become the National Centre for Sustainable Construction (NCSC). Wolverhampton is experiencing the alignment of unique local conditions and drivers for change, making the development of a people and place-based strategy time-critical.

This programme provides an opportunity to test and demonstrate sustainable construction concepts, and act as a demonstrator for the wider NCSC concept. The city is already home to the recently opened National Brownfield Institute, and there may be opportunities to test new approaches to circularity in design, modern methods of construction, and supply chain development for construction as part of this concept.

4.1.5 3 Cities Retrofit Programme

3 Cities is a unique collaboration between Birmingham, Coventry and Wolverhampton to lead the way in unlocking transformative opportunities to accelerate green economic growth, address decarbonisation, and boost investment and inclusive growth. The current retrofit programme[8] is seeking to accelerate net zero by securing investment in insulation and lower-carbon energy in 700,000 homes across Birmingham, Wolverhampton and Coventry, starting with the 165,000 social homes in the three cities.

[7] https://www.wolverhampton.gov.uk/planning/planning-policies/housing-site-information
[8] 3 Cities, 2022

4.2 Housing stock

Summary of key findings and conclusions

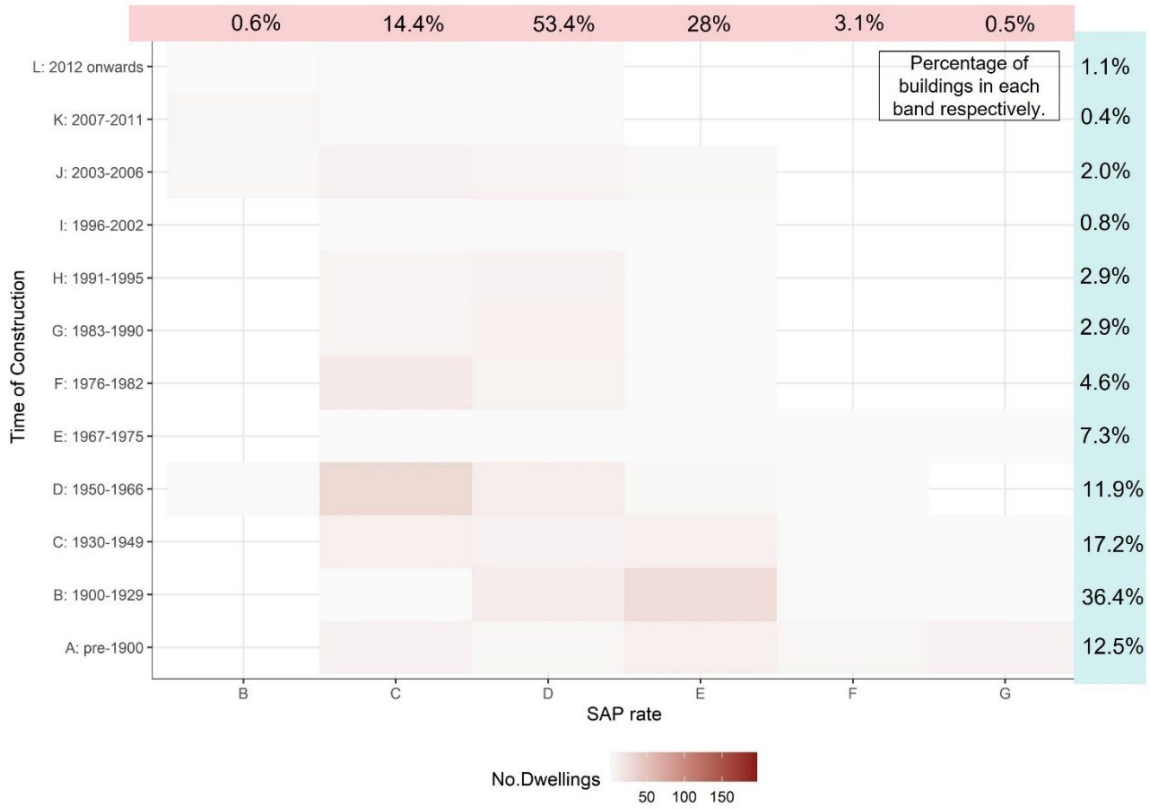
- Graiseley has a combination of old, poorly insulated housing heated by gas combi-boilers. Areas should be prioritised for intervention based on their poor SAP ratings and high carbon emissions. Modelled energy related emissions were 21.5 $ktCO_2e$.
- Addressing this would also help tackle wider socio-economic factors (see section 4.6), including high fuel poverty (20-30% bands) and areas that score high in deprivation, specifically for income and quality of local environment.
- Many households are likely to be eligible for funding through existing housing retrofit programmes, given factors such as household income. There is an opportunity match this with other funding to make optimal use to achieve higher bill savings and carbon emissions reduction.

4.2.1 Age and building type characteristics

Graiseley Ward's housing stock represents 5% of dwellings in Wolverhampton[9]. The stock was mainly built before 1949 (over 3,700 dwellings) with more than 2,500 dwellings at least 100 years old (see Figure 7). Since 2012, an additional 29 new houses have been built in the Ward. Areas in the north of Graiseley are mostly terraced homes, which front directly onto the street, with semi-detached and detached homes with driveways, gardens, and tree lined streets more common towards the south of the Ward.

Most dwellings are houses (approx. 3,800), followed by apartments (approx. 1,680), with some bungalows and maisonettes. 64% of the residential buildings have solid brick walls (31% cavity walls). In relation to roof and window systems, the properties in the Ward are mostly double glazed with pitched roofs.

Figure 7: Number of Dwellings in Graiseley sorted by age in each SAP Band rating (Source: Parity Projects 2022)



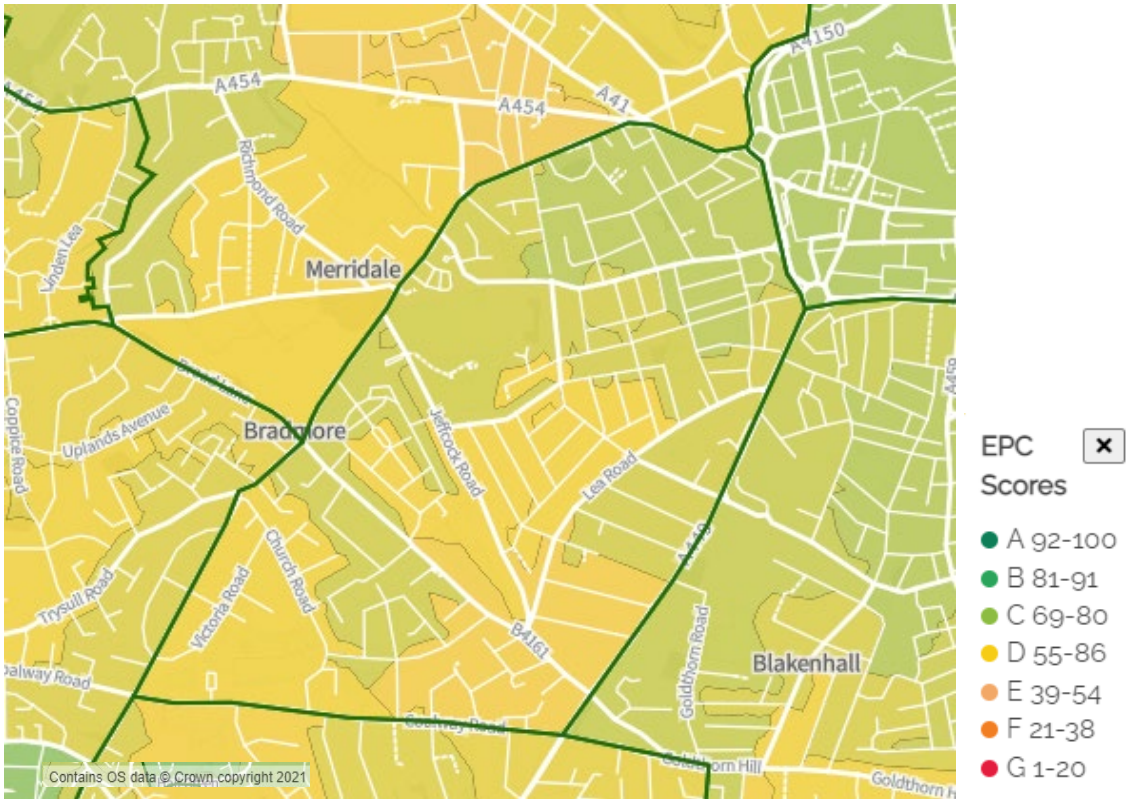
[9] Parity Projects 2022

4.2.2 Energy performance and carbon emissions

The SAP rating is a metric of the energy performance of dwellings. In UK's climate, the main energy demand in residential buildings is for heating. The heating load is a function of the heat losses from a building's outer shell, losses from ventilation and infiltration. The energy consumption for heating and consequent emissions are driven by the heating demand but they are also affected by the efficiency of the heating system and the fuel type.

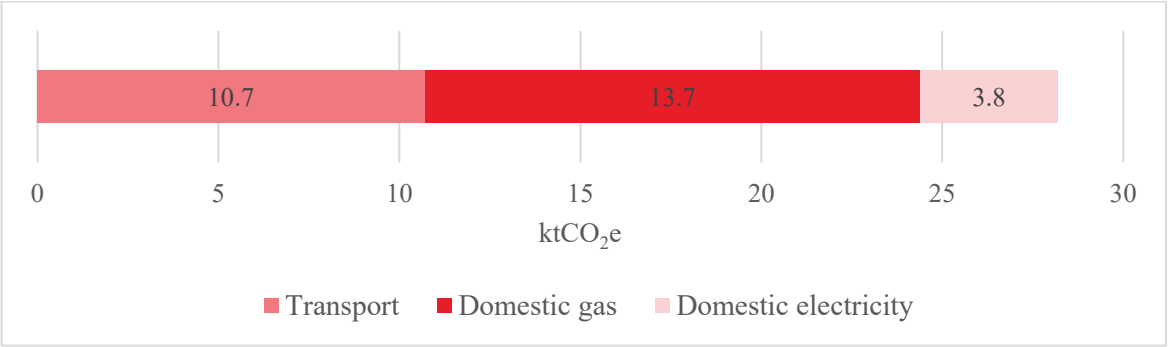
Most dwellings (approx. 3,000) in the Ward have an estimated SAP rating D[10]. There are over 1,500 dwellings with an estimated SAP rating E, and approximately 200 dwellings with an estimated SAP rating of F and G (see Appendix A.1). Spatial hotspots in the Ward can be identified in Figure 8.

Figure 8: SAP Ratings in Graiseley (Place-based carbon calculator)



According to BEIS Sub-national domestic energy consumption datasets[11], the gas consumption in 2020 was 74.5 GWh and the electricity consumption was 16.3 GWh (based on median consumption). The total domestic, energy related carbon emissions were 17.5 $ktCO_2e$ (Figure 9).

Figure 9: 2020 Domestic Carbon Emissions for Graiseley (Data source BEIS and Place-based Carbon Calculator[12])



[10] Parity Projects 2022

[11] BEIS, Domestic electricity and gas consumption by Lower Layer Super Output Area (LSOA), Great Britain, 2010-2020. https://www.gov.uk/government/collections/sub-national-electricity-consumption-data

[12] Morgan, Malcolm, Anable, Jillian, & Lucas, Karen. (2021). A place-based carbon calculator for England. Presented at the 29th Annual GIS Research UK Conference (GISRUK), Cardiff, Wales, UK (Online): Zenodo. http://doi.org/10.5281/zenodo.4665852 .

The total domestic energy consumption in Graiseley, based on SAP modelling, was 107 GWh. The energy related emissions as modelled were 21.5 $ktCO_2e$. SAP D rated residential buildings were responsible for 52.7 GWh energy consumption and 10.7 $ktCO_2e$ emissions. SAP rated E and F dwellings had a total energy consumption of 47 GWh and produced 9.4 $ktCO_2e$ emissions, respectively. The assessment of carbon emissions reduction from building retrofits was based on SAP modelling results, therefore the estimated 21.5 $ktCO_2e$ were used for the baseline in the evaluation of any measures and scenarios.

4.2.3 Pathway to net zero

Scenarios have been considered to assess cost and impact of improved energy performance and carbon emissions reduction in homes for a pathway to net zero in the Ward (see Table 1).

Table 1: Pathway to net zero scenarios for Graiseley (Source: Parity Projects Pathways Scenarios 2022)

Deep retrofit scenario - reduce the heating demand to 50 kWh/m^2	Retrofit scenario - achieve SAP rating C in as many homes as possible
Likely cost of approx. £165 million, including heat pumps installation and PV generation. 5,644 homes	Likely cost of approx. £66 million. 4,794 homes.
CO_2 emissions potentially reduced by 18.6 $ktCO_2$, or 86.5% of the estimated 21.5 $ktCO_2$.	CO_2 emissions potentially reduced by 8.5 $ktCO_2$, or 39.5% of the estimated 21.5 $ktCO_2$.
£8,871 per tCO_2 reduction	£7,765 per tCO_2 reduction
Final domestic emissions estimated are 2.9 ktCO2 .	Final domestic emissions estimated are 13 $ktCO_2$.

In addition, a model developed by *Bankers without Boundaries* (BwB) [13]suggests that the spill over value from retrofit and energy infrastructure related investment could have almost equal value with the cost savings from energy and maintenance. This value can be captured from fuel poverty alleviation, job creation, healthcare outcomes, educational attainment, improved air quality and increased productivity. A holistic socio-economic assessment would need to consider and include the tangible and the non-monetary value of occupants' comfort, pride of the community, better air quality, satisfaction, and well-being.

4.2.4 Heating source and demand

The main heating system of dwellings in Graiseley is a hot water-based system powered by gas combi-boilers (over 3,300 dwellings). Approx. 1,130 properties have regular gas boilers, and approx. 840 properties have electric storage heaters. Old combi-boilers are expected to have an efficiency rating C and below. Most of the heating systems have a programmer, with a large number having a combination of programmer, room thermostat and TRVs. A breakdown of the heating demand and carbon emissions for different areas in Graiseley is available in Appendix A.1 (Figure A1.2.2).

4.2.5 Housing retrofit programmes

CWC, in partnership with Marches Energy Agency, are delivering the Green Homes Grant - Local Authority Delivery Scheme (LAD), which covers part of the Graiseley Ward and Blakenhall. The scheme aims to enable homeowners on low incomes (less than £30,000 per annum), to make energy efficient improvements which can include floor and loft insulation, storage heaters, and energy efficient windows and doors. Homes eligible for the scheme need to have an Energy Performance Certificate (EPC) of D or below. Further programmes are expected to come forward, including Home Upgrade Grant 2 (HUG) and the Energy Company Obligation 4 (ECO). Investment is also being targeted at Wolverhampton Homes properties through the Social Housing Decarbonisation Funds (SHDF) and general capital investment.

Overall, CWC have been allocated:

- £1.35m of LAD 3 Funding
- £450K of HUG1 funding
- Operating the ECO3 support programme and looking to extend the ECO 4 support
- £100,000 has been granted through SHDF Wave 1, with additional funding anticipated

[13] Bankers without Boundaries, Blended finance model as shown in UK Cities, Climate Investment Commission (UKCCIC), City Investment Analysis Report Available at:https://cp.catapult.org.uk/news/uk-cities-climate-investment-commission-report/

4.3 Transport infrastructure

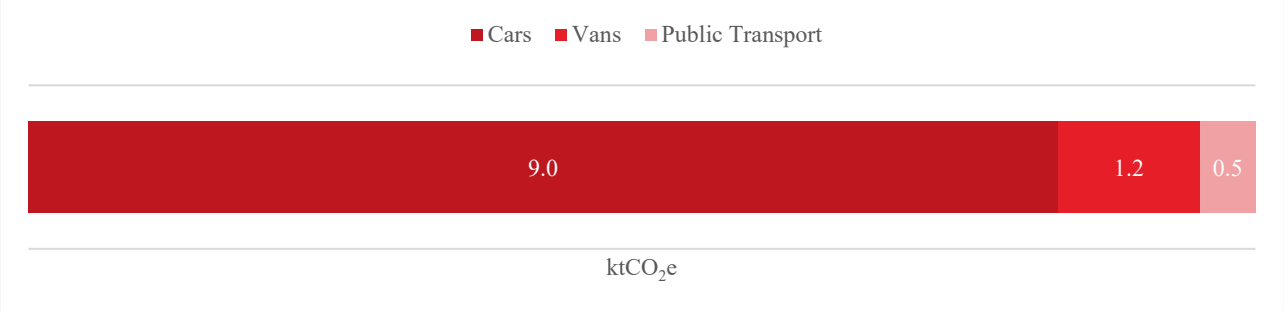
Summary of key findings and conclusions

- Transport evidence indicates that NZN interventions should focus on measures to provide quality active travel experience to key destinations and public transport routes to increase walking and cycling, particularly in areas where there are barriers to movement including the overall quality of the street scene. It is estimated that if a 'go Dutch' style reallocation of road space to cycling be undertaken within Graiseley, there could be cycling rates of up to 22%, saving 63.9 tCO2e/year[14].
- Whilst EV take-up is expected to be lower given household income (more acute in certain parts of the Ward than others), there are still opportunities to make sure the Ward is ready for future uptake linked to national Government and CWC objectives. On its own the recent increase in fuel prices may accelerate the transition to electric vehicles, however, in many cases this will not be possible due to the cost of new cars and the relatively small used car market, as well as the increase in cost of living. Car sharing groups, access to free/subsidised EV charging points and installation of driveway and garage chargers as part of house retrofits are some measures that could help low-income households to cope with the rise of energy and living costs.

4.3.1 Transport Carbon Emissions

The Place Based Carbon Calculator (Figure 10) was used to gain an insight into transport related emissions from the activities of people living in Graiseley (note all these emissions happened within the Ward). The estimated 10.7 $ktCO_2e$ emissions (2018 data) were predominantly generated from cars.

Figure 10: Transport carbon emissions estimate for Graiseley Ward, $ktCO_2e$, 2020 (Place Based Carbon Calculator[15])



4.3.2 Existing movement corridors

The most common commuting method in the Ward was by private car[16] (44% of all commuting journeys). Of these, the most frequent trips were from the south of Graiseley, while trips from the north of the Ward were more spread but focused predominantly travelling to the more commercial areas across the city centre towards Wednesfield and to Ettingshall (see Figure A1.3.1). The percentage of households with a car or van in Graiseley is 59%, which is below the average for the city (66%)[17]. Overall, 70% of residents have access to at least one car.

Walking is recorded as a less frequent mode for commuting than private car, with the most common trips from the north of the Ward across to Blakenhall (to the immediate east of the Ward), and from the south of the Ward to the north. Cycling numbers throughout the Ward were low, just 26 responses overall[18] representing 2% of all commuting journeys. Some of the main roads in and adjacent to the area, including

[14] Propensity to Cycle Tool - West Midlands (pct.bike)
[15] Morgan, Malcolm, Anable, Jillian, & Lucas, Karen. (2021). A place-based carbon calculator for England. Presented at the 29th Annual GIS Research UK Conference (GISRUK), Cardiff, Wales, UK (Online): Zenodo.
[16] Census 2011
[17] Transport and Neighbourhoods - WVInsight (wolverhampton.gov.uk)
[18] Census 2011

parts of Penn Road and the city centre ring road are dual carriageway which can negatively impact on people choosing more sustainable modes of transport.

4.3.3 Electric Vehicles (EV) and charging points

In May 2022, the percentage of electric cars is estimated to be over 480,000 on UK roads[19]. With low household income levels and high fuel poverty in the Ward (see 4.6.5), it is expected that this level is lower than the national percentage, however it is a rate that is expected to rise given national Government policy[20]. Currently Graiseley has one public EV charging station, with two charging bays located at Clifton Street Car Park in the north of the Ward. CWC is currently working on deployment of EV Charging Points across the City with 28 new on-street residential chargers (Figure 11) being installed at 14 locations across Graiseley Ward[21].

4.3.4 Public transport

Graiseley is served by both high and lower frequency bus routes, covering most of the Ward, providing access to the centre, the west and north of the city, and to areas of Dudley (see Figure A1.3.2). There is no other public transport provision within the Ward, although the bus services to the city centre provide access to the closest train and Metro stations.

4.3.5 Walking, cycling and active travel infrastructure

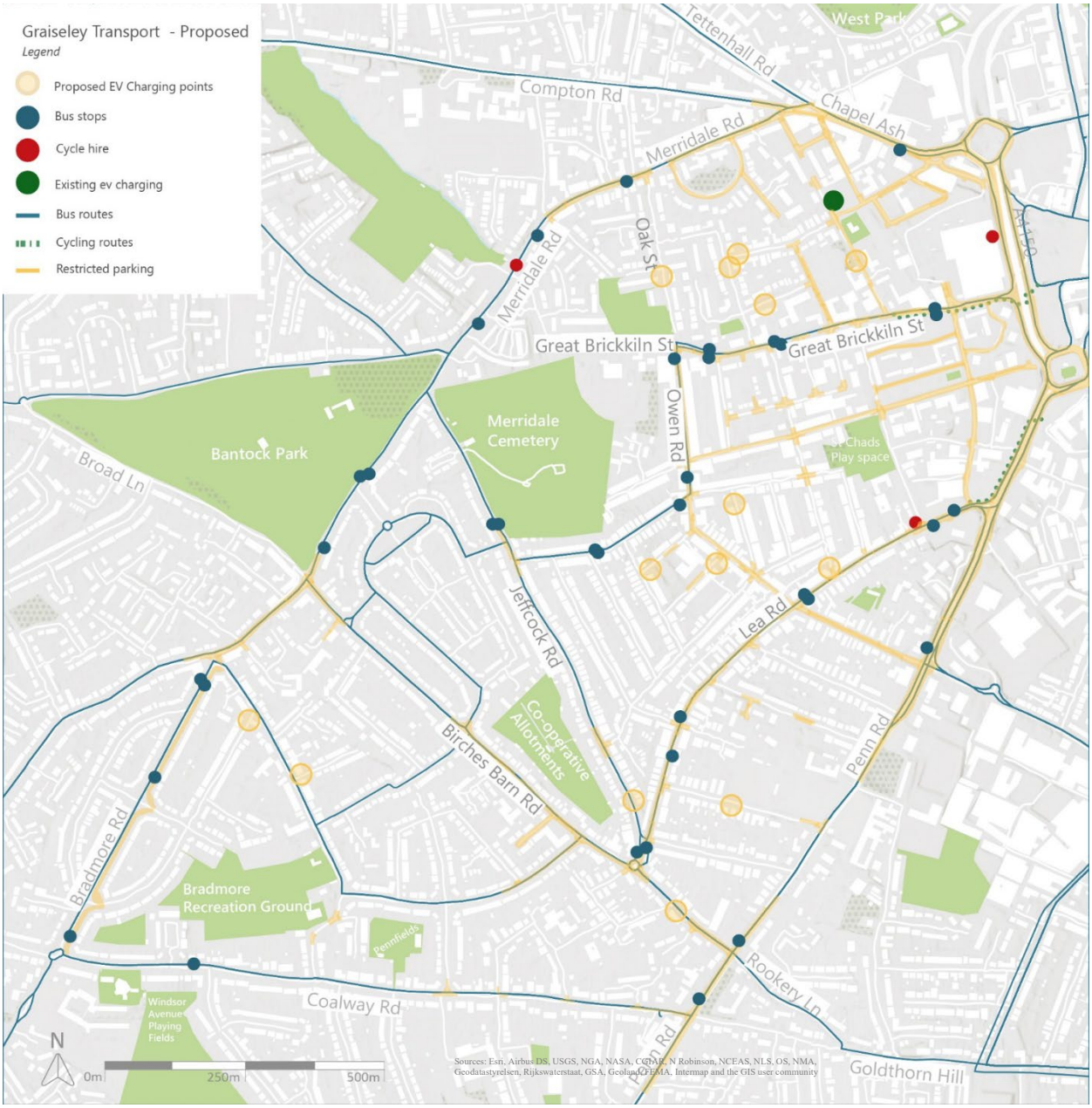
Graiseley is reasonably walkable with routes in the north and east of the Ward predominantly focussed on accessing the city centre. It has a walking distance of approx. 20-50 minutes' walk to the city centre depending on where you travel from in the Ward. Pavements are generally quite wide, however there are barriers to using them effectively due to the high levels of street parked cars and bin storage which partly block footways in many areas of the Ward. This is relevant in areas of terraced housing and areas without off-street parking.

There are no national, regional or city-wide cycle routes in the area, and only limited existing provision in the Ward. There is one cycle hire on Merridale Road (near the junction with Aspen Way) and there are four stations near Sainsbury's supermarket, as well as on Lea Road, Penn Road and Marston Road to the north-west of the Ward[22].

E-scooters are not currently present in Wolverhampton and are being trailed in other areas of the West Midlands.

[19] https://www.zap-map.com/ev-market-statistics/
[20] https://www.ofgem.gov.uk/sites/default/files/2021-09/Enabling%20the%20transition%20to%20electric%20vehicles%20-%20the%20regulators%20priorities%20for%20a%20green%20fair%20future.pdf
[21] Through the Office for Zero Emission Vehicles On-street Residential Charging Scheme
[22] West Midlands Cycle Hire wmcyclehire.co.uk

Figure 11: Sustainable Transport Infrastructure in Graiseley



4.4 Energy infrastructure

Summary of key findings and conclusions

- Measures to improve building fabric performance and increase energy efficiency in Graiseley such as adding insulation will enable electrified heating technologies to operate most effectively. Electrification of heat, with direct electric heating or preferably heat pumps, will enable buildings to capitalise on grid decarbonisation leading to significant carbon savings[23].
- There is potential for solar PV on rooftops in Graiseley and this can further reduce grid imports and associated emissions, particularly when combined with integrated battery storage. The integration of battery storage with solar PV systems can improve resilience, reduce energy costs for consumers and improve emissions performance, although it adds to the capital cost.
- There is similar potential in the Ward for solar thermal, and this can be integrated on roofs to provide renewably generated hot water, which can also be stored in thermal vessels during times of surplus generation for later use. As unit rates for electricity are generally higher than for units of heat, solar PV is often the preferred choice for south-facing roof space.
- The development of Low carbon heat networks in Graiseley could potentially enable the transition from gas boilers to electric heat pumps by reducing the capital investment required by individual households and by easing any installation issues at houses. Successful implementation of communal heating would require new forms of management that could be piloted in the area.

4.4.1 Existing renewable energy infrastructure

Domestic solar PV is the most common local renewable energy system at neighbourhood scale in urban environments. Most domestic solar PV installations are expected to be registered as "≤4kW (retrofit)" for the purposes of feed-in tariffs (FITs). Ofgem's report[24] on FIT installed capacity shows that there is no installed PV capacity in Graiseley Ward, however it is still likely that some PV installations have not been registered to the scheme. This includes the recent housing development at Elias Mattu Avenue to the north-west of the Ward which has solar panels.

Figure 12: Example of new housing development with solar energy systems in Graiseley (Source: Google Maps 3D).

[23] https://www.nationalgrideso.com/future-energy/future-energy-scenarios/fes-2021/documents (see 'Data Workbook' for charts of grid carbon trajectory) and https://www.gov.uk/government/publications/valuation-of-energy-use-and-greenhouse-gas-emissions-for-appraisal (see Dat Table 1)
[24] https://www.ofgem.gov.uk/publications/feed-tariff-fit-quarterly-report-issue-48

4.4.2 Existing grid capacity

Western Power Distribution (WPD) manages the electricity network in the West Midlands. The substations serving Graiseley are split between two sites, and are found elsewhere in the local area, with the north of the Ward served by substations on Bilston Road, and the south from the substation near Castlecroft (see A1.4).

Small scale renewable energy schemes, such as solar PV panels on individual houses, can generally be accommodated in the existing electricity networks, particularly as the homes are already accounted for in the network. For Graiseley, whilst there is broadly capacity available, there is less headroom in the substations to serve the north of the Ward (see A1.4), which in the long term would need to be addressed at a city scale given this network also serves the city centre and its future growth.

Assuming an average installed solar PV capacity of 2kWp per roof (see 4.4.3) in 1,100 houses, installing rooftop solar PV could add a maximum of 2.2MW export capacity onto the local distribution network. A high-level review of nearby primary substations suggests that there is potentially sufficient generation headroom available to accommodate this capacity, however, this needs to be verified with WPD. The capacity of the local electrical infrastructure (for instance, electrical infrastructure connecting homes to primary substations e.g. cables, secondary substations etc.) will also need to be verified with WPD.

In addition, there are options to help manage network constraints, including battery storage within homes and the potential to explore micro networks of battery storage in the area to create independent networks or working with Distribution Network Operators (DNOs) as part of partnership arrangements.

4.4.3 Renewable and localised energy potential

Solar PV

In the UK, it is unlikely that solar PV will have a significant contribution to local carbon emission saving targets due to the very low future projections of the grid's carbon intensity. However, it can help reduce the additional power requirements from the grid as heating and transport convert from fossil fuels. It can also be an asset for the community, enabling local solutions and innovation in energy distribution and finance.

The total domestic electricity consumption for the NZN area[25] in 2020 was approximately 16.3 GWh (median metered kWh)[26]. Assuming it would be feasible to install solar PV panels on 20% of the total number of dwellings in Graiseley, rooftop PV could generate 1.94 GWh annually[27].

The cost of this scenario is approx. £4.5 million based on £4,000 for 2 kWp on 1,130 roofs[28], excluding the cost for grid connections and any battery storage. Electricity Act Regulations mean that supply licenses would be needed for any solar PV scheme supplying more than 1MW directly to domestic consumers via private network and would require administration that would reduce the commercial viability of such installation. Solar PV panels also offers the potential to be used to charge electric vehicles. Integration of battery storage (or used in communal schemes) with solar PV systems can improve resilience, reduce energy costs for consumers and improve emissions performance, although it will add additional capital costs.

Solar Thermal

As unit rates for electricity are generally higher than for units of heat (when generated with a heat pump, this is not the case when using direct electric heating), solar PV is often the preferred choice for south-facing roof space, however solar thermal remains an alternative to consider. Solar thermal panels on roof top space (flat plate or evacuated tube) could be sized appropriately as part of a renewable heat system, which can also be stored in thermal vessels during times of surplus generation for later use (e.g. generation during the day can provide hot water supply at night). These networks can be connected to solar PV panels and existing boilers or heat pumps to provide an integrated approach to renewable heating.

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[25] https://www.eonenergy.com/solar-panels/cost.html

[26] BEIS, ONS, Domestic electricity consumption by Lower Layer Super Output Area (LSOA), Great Britain, 2020. https://www.gov.uk/government/statistics/lower-and-middle-super-output-areas-electricity-consumption

[27] This is technically feasible based on reasonable assumptions of: Roof space on 1,130 roofs, space requirements for 2 kW_P (5 panels x 1.95 m^2 =9.75 m^2) with a slope angle (pitched roof) of 40 degrees and South-West orientation; 1kW peak power installed = 860 kWh electricity generated annually[27]; PV panel example, Canadian solar HiHero of approx. 420 W panels[27] (1722 x 1134 mm = 1.95 m^2)

[28] https://www.eonenergy.com/solar-panels/cost.html

Whilst feasible in Graiseley given the building stock, a detailed assessment will be required to estimate the potential, cost the system, and size its components. The load-demand matching is important to optimise the system efficiency and cost. Solar thermal panels could be used in conjunction with solar PV panels or as an alternative solution on rooftops with unfavourable orientation for PV, depending on the diurnal house occupancy and hot water demand.

For maximum renewable generation capacity and carbon reduction potential, solar thermal could also be integrated on north/east/west-facing roofs (assuming south facing roofs have solar PV), however thermal yields for solar thermal panels on north-facing roofs would be reduced compared to those on south, esp. during winter, which also leads to much higher payback times for panels.

Heat pumps

Air and ground source heat pumps are electric heating systems that extract heat from the air or ground to deliver heating in houses. They have very good efficiency, which means they use less energy than gas combi-boilers to deliver the same amount of heat. Heat pumps use electricity, and in countries such as the UK where the carbon intensity of the electricity grid network is relatively low, they can play an important role to the decarbonisation of heating.

Installation of heat pumps needs to be considered as part of a "whole building" retrofit approach as they will work efficiently in houses with small heat losses from ventilation and the building fabric. A big difference to gas combi-boiler systems is that the temperature of the water used for heating is lower than the temperature of the typical boiler with radiator systems, meaning they are usually installed with underfloor heating or highly efficient radiators. The main limitations are the initial cost for the installation and potential replacement of radiators, and the space requirements for the heat pump unit and an insulated water tank cylinder. There is potential for this technology in Graiseley, including consideration of heat pumps as part of renewable mini-heat networks.

Renewable Heat Networks

Renewable heat networks could provide low carbon heat at the local / neighbourhood scale. A detailed analysis of heat demand and renewable energy potential is necessary to identify the mix of technologies and the cost of the associated infrastructure for generation and distribution. Such a network would use a combination of large capacity air and/or ground source heat pumps, solar thermal and/or PV panels and hot water storage to provide heating at district level (top-up gas boilers could also be used). The capital investment and space required will need to be carefully considered at scoping stage. There is also the potential to connect into a city centre district heat network, which the CWC is currently investigating.

At local / neighbourhood scale, micro-heat networks that combine communal ground and/or air source heat pumps and thermal storage, could help to alleviate fuel poverty and provide low-carbon heat and comfort to connected clusters of houses. Such mini networks could utilise public space (e.g. for heat pumps and thermal storage) and rooftop PV electricity generation to introduce a low carbon, cost effective heating system for residents. This could future proof the heating system and increase community resilience and well-being.

Local Electricity Storage

There is increasing interest and demonstrators for local electricity storage, either in the form of small, distributed, and interconnected battery storage or larger in capacity and size community storage. Those schemes use PV generation excess and grid electricity when necessary to charge batteries that can be used by grid operators or locally (depending on scheme operation and regulations). Battery storage may mitigate high connection costs by enabling effective grid balancing services with potential added revenue benefits.

The first step towards a local electricity storage scheme would be to size the battery system according to the local PV generation and decide on the operation and connections of the system. Private wires, metering infrastructure and connections to grid substations are part of the infrastructure needed to enable roll out. Ownership, investment, and management are important to be defined early in the design as the governance and delivery mechanisms will affect the cost effectiveness, system design and installation. Communal battery storage schemes could help with the capital investment and maintenance costs, although it should be noted that batteries have embodied carbon emissions associated with the materials and their construction and end of life/circularity. Optimisation of the capacity and operation of the battery system (e.g. depth of discharge, recharge rate, temperature) can increase the lifetime of the batteries and its cost-effectiveness, and decrease the final carbon intensity of the system.

4.5 Other local assets and infrastructure

Summary of key findings and conclusions

- The proposal in the delivery plan recognises the value of greenspace and aims to enhance its quality and everyday use from the residents. Greenspace is important for air pollution, water drainage, biodiversity, wildlife, urban heat island but also as an enabler of active travel and a contributing factor to well-being.
- There are a good mix of open spaces in Graiseley which serve the community. There is also extensive tree cover throughout the area, either on street or in gardens.
- Community buildings are well represented in the north and the more deprived parts of the Ward. This may affect the feeling of community in these areas. These buildings will need to be assessed for improvements as part of the NZN.
- There is scope for improving the green infrastructure networks, particularly at the street level as part of improving the overall environmental quality and providing and enhanced environment to encourage active travel.

4.5.1 Street environmental quality

The overall quality of the streets in Graiseley varies by area and are informed by its built environment. The suburban areas in the south of the Ward are characterised by off-street parking, larger green gardens and tree lined streets more common. In the north of Graiseley, particularly where there are terraced homes, the quality of the street suffers from on-street parking, fewer street trees and on-street bin storage. This blocks pavements and such barriers can discourage walking and cycling and makes it more challenging to introduce new green street scape features into the build environment.

An LED Street light programme is already underway across the whole city, approximately 50% of the installation has been completed in the Graiseley Ward.

Figure 13 Some street areas in the north of the Ward are cluttered by parked cars and bins, with little green infrastructure

Figure 14 Streets in the south is more suburban in feel, with off-street parking, wider pavements and more green infrastructure

4.5.2 Green infrastructure

There are key green infrastructure assets in Graiseley, with 9,820 trees in the Ward, and 21.7 hectares of open space (nearly 10% of the total area) (see Figure 15). The network of open space includes public open space, such as play space and parks, with the remaining areas having restricted access including allotments, cemeteries and school playing fields. Overall there is nearly 1.6 hectares of open space per 1,000 residents, however some areas of the Ward are not within 300 metres of accessible open space (see A1.5).

CWC's Tree and Woodland Strategy[29] was adopted in January 2020. It sets out a vision for a City with an increasing stock of trees, hedges and woodland. Objectives include protecting existing stock of trees, woodland and hedgerows; increasing overall coverage across the city in its breadth of locations. CWC have recently introduced the City's first 'tiny forest' onto Oak Street recreational ground in the north of the Ward, which is the first tiny forest in the Black Country. Additional tree planting schemes are on-going within the area to help improve the urban environment through urban greening, including free trees for local schools via the Woodland Trust to help green up local schools.

Diversity of natural habitants can support biodiversity, increase resilience, deliver carbon emissions savings from carbon storage and sequestration, and positively affect natural ventilation, cooling potential and overheating mitigation. There are also benefits in terms of air quality, mental health, and well-being of residents. The Valuing London's Urban Forest report[30] estimates that in Outer London the monetised value of pollution removal is £68.1m (1,680 t), carbon sequestration £3.8m (61,300 t) and storm water alleviation £2.2m (2,709,000m^3) per annum. The same report has found that property value of tree lined streets can increase up to 15%.

Figure 15: Existing open spaces and tree cover in Graiseley

[29] Tree & Woodland Strategy.qxp_Layout 1 (wolverhampton.gov.uk)
[30] https://www.london.gov.uk/sites/default/files/valuing_londons_urban_forest_i-tree_report_final.pdf

4.5.3 Community assets

There are a number of existing community assets serving Graiseley Ward, particularly in the area close to the city centre. The assets include community buildings, three primary schools and a number of places of worship serving different communities (see Figure 16).

The planned improvements to CWC facilities for 2022/23 include large repairs (i.e. roof repair at the Graiseley Health Living Centre) and heating / ventilation interventions, although none currently entails deep retrofit or conversion to low carbon energy sources.

As well as the buildings where they are located, these assets offer opportunities for adoption of net zero neighbourhood behaviours at a community scale, including workshops and learning sessions where community groups and residents can share their ideas and approaches to being net zero.

Figure 16: Existing community facilities and assets in Graiseley.

4.6 Community

Summary of key findings and conclusions

- There are signs of deprivation in the Graiseley Ward, with the information indicating that areas closer to the city centre are more affected by issues of fuel poverty, health inequalities and other issues. Interventions in the NZN programme could make a real difference to these challenging social issues.
- The housing tenure, with a higher level of private rented accommodation, indicates that the community in places will be more transient than owner occupied homes. Diversity is a strength of the area, with a number of different ethnic and cultural backgrounds. These matters need full consideration in the delivery strategy for delivering net zero measures and will present opportunities to demonstrate new approaches.
- The CWC is active in the area through its service delivery, and there are some strong community groups showing there is a core of people willing to offer support, especially for those that need it most. At this stage there is not a clear picture that this reaches all groups in the community. To date there is also a lack of information on engagement, involvement, or education on opportunities relating specifically to net zero. These gaps will need to be addressed.
- Local Councillors have an important role as key promoters of the net zero programme. They should be engaged with to provide support and buy-in. They and the Place-based Team at CWC will need to work within the community and they can help provide stability to address the challenges of engaging with the more transient sections of the population and translate their views into service delivery.

4.6.1 Population and Ethnicity Profile

As of 2020, the population estimate for Graiseley Ward totalled 13,434 people[31]. Many of the residents are aged between 25 to 54, with the largest in the band of 30 to 34. There are also significant proportion of children, particularly, those between 5 to 10 years old. These figures follow similar trends for the city. There is a roughly even split of men and women in the population[32]. Graiseley also has the highest population density in Wolverhampton, with 55.2 people per hectare[33].

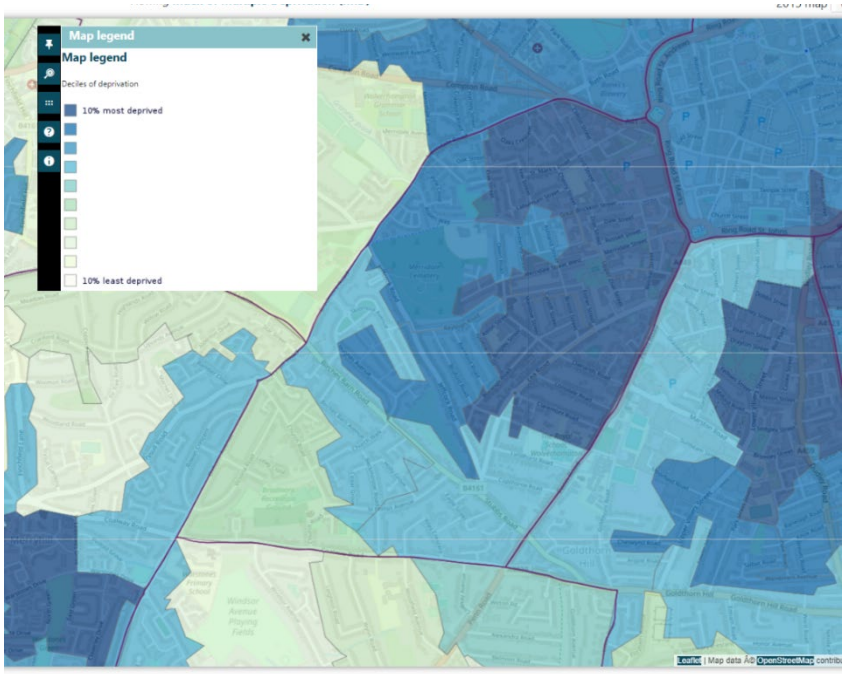
Just under half of all residents come from black and minority ethnic backgrounds, with over a fifth being born outside of the UK, Republic of Ireland, and EU. With multilingual, diverse communities, it is imperative to consider the methods of engagement as part of a NZN, particularly given English may not be the main language for people in the area.

4.6.2 Indices of Multiple Deprivation

Large parts of Graiseley are listed in the 10% most deprived areas nationally (Figure 17), with areas closer to the city centre affected by multiple deprivation (IMD) metrics. IMD is measured using a score after weighing multiple components of deprivation (such as income, employment, education. health etc) with different strengths. There are areas within the Ward that consistently underperform, including education and living environment indicators. There is a need for deeper understanding of the connection among living environment, wellbeing, health, and education, and how NZN can help address these issues.

[31] Population - WVInsight (wolverhampton.gov.uk)
[32] Equalities - WVInsight (wolverhampton.gov.uk)
[33] https://www.wolverhampton.gov.uk/sites/default/files/pdf/Wolverhampton_City.pdf

Figure 17: Indices of Multiple Deprivation in Graiseley



4.6.3 Housing tenure

At a Ward level, there are fewer dwellings privately owned (50%) and socially rented (24%), which is below the city average (57% and 28%)[34]. There are also more privately rented households in the Ward (24%) than the city average (13%)[35]. There is also a varying spatial distribution of housing tenure in the area (see A1.6), with areas closer to the city centre between Chapel Ash and Penn Road having a much higher mix of social housing and private rented accommodation indicating a more transient community. Delivery of NZN will require different techniques and delivery methods depending on who owns and live in the homes

4.6.4 Health

Graiseley is ranked as the 6th highest out of 20 Wards for poor health[36]. Overall life expectancy in Wolverhampton is lower compared to the national average for England, with cardiovascular diseases noted as a particular high cause. The amount of the population providing unpaid care is lower in Graiseley than the city average, ranked 8th out of 20 Wards[37]. A NZN can help to address these health inequalities.

4.6.5 Household income

Key information on household income can highlight issues of financial difficulties and cost of living difficulties for residents, such as being able to afford heating bills. In Graiseley, the area closer to the city centre has an annual household income of just under £30,000, with the area to the south higher at £40,000[38].

In May 2022, the benefits claimant count of Graiseley was around 9.6% of the total amount of Universal Credit claimed in the city, as the third highest Ward[39]. The biggest age group claiming universal benefit in the Ward are those aged between 25-49, revealing that there may be higher unemployment rate within this age group, or other circumstances that put them in a position of claiming benefits.

[34] Housing - WVInsight (wolverhampton.gov.uk)
[35] Housing - WVInsight (wolverhampton.gov.uk)
[36] Source: WVInsight
[37] Source: WVInsight
[38] Source: Total Annual Household Income is sourced from Income Estimates for Small Areas, England & Wales, Financial year ending 2018,
[39] Economy and Employment - WVInsight (wolverhampton.gov.uk)

Graiseley on average has more than 20% of households considered to be in fuel poverty (the city average is 22.4%[40]), with areas of over 28% fuel poverty in the areas around Bradmore Road and Lime Road[41]. The area to the west of Oxbarn Road has the fewest households in the Ward in fuel poverty (16%).

4.6.6 Community groups and other stakeholders

There are already a number of active community groups in Graiseley (Figure 18), with a mix of groups that are led by CWC and other public sector partners or led by the community.

Local Councillors will play an important part in the NZN as representatives of their constituents. Three ward Councillors for Graiseley are: John Reynolds, Jacqui Sweetman, and Asha Mattu. Stuart Anderson MP, the Member of Parliament for Wolverhampton South West has actively pursued matters that relate to net zero, including efforts to help elderly and working-age residents save money on utility bills, make it easier to access to affordable energy efficiency schemes.

Wolverhampton Homes is an Arm's Length Management Organisation and is responsible for managing most of the council homes in Wolverhampton. Almost a quarter of properties within the Graiseley Ward are socially rented with 12.7% being socially rented through the council. As a result, they will be a key stakeholder to engage with.

Figure 18: Examples of Existing Community Groups and Engagement Initiatives in Graiseley

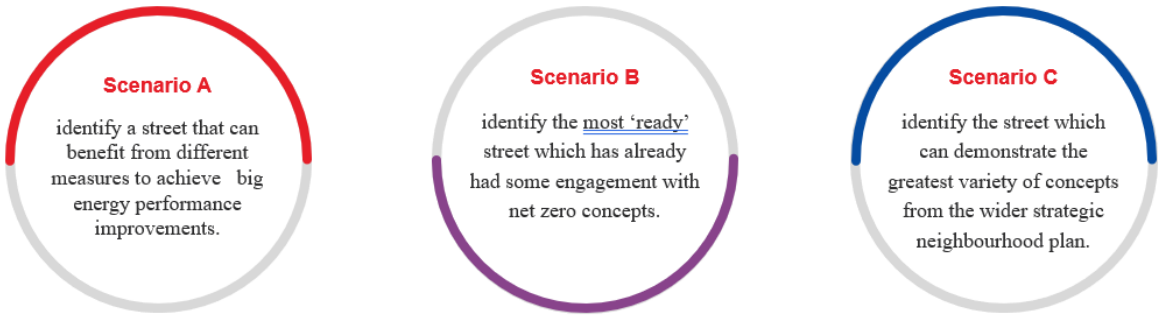
[40] Sub-regional fuel poverty data 2022 - GOV.UK (www.gov.uk)
[41] Data from Department for Business, Energy & Industrial Strategy (BEIS) 2020

5. Phase 1, street-level demonstrator

5.1 Selection of the demonstrator area: assessment criteria and outcome

The £1.65 million available from the WMCA is for the delivery of the first phase of a NZN Demonstrator Plan. For Graiseley, to address the challenges of delivering the necessary scale and pace of change in net zero, a suitable sized area had to be selected for Phase 1. Three different approaches were considered in identifying an appropriate street(s) as set out in Figure 19.

Figure 19: Selection of Street-level Demonstrator Scenarios



Based on the advantages and disadvantages of each approach (see A1.7), the vision and outcomes for Graiseley NZN, and the ambitions of the Demonstrator Programme from WMCA, a blended approach of Scenario A and C was selected. This was considered the most appropriate way to address an area which has a high level of retrofit need and that also can illustrate how some of the wider NZN concepts can be adopted.

5.1.1 Assessment criteria

Based on a blended Scenario A and C approach, the following criteria were used to identify suitable streets as part of the Phase 1 programme:

- Areas of the Ward were assessed for their mean carbon emissions, mean heating demand per m^2 of floor area, and house energy performance according to SAP rating score and band estimations.
- The areas with the poorest performance were further analysed to identify house types, age, building construction and heating systems.
- The location of the areas with the poorest performance were evaluated in relation to neighbouring streets and amenities in the ward. An initial, virtual site inspection was performed with street view.
- The potential intervention street areas were located into the multiple deprivation maps, those in particular about the "Education, skills and training" and the "Living Environment" domains.
- Fuel poverty, LSOA level data, showed that fuel poor households are in general similarly distributed into the Ward areas.

5.1.2 Shortlisting

All streets in the area were considered for inclusion and based on the assessment criteria, two broad areas were shortlisted for the initial phase of investment. A summary is provided in Table 2, with the area facing more sever issues highlighted in the assessment. Based on this assessment, Area B to the east and west of Owen Road was prioritised for investment. This was then further refined under guidance from the WMCA[42] to identify an area of a suitable scale of approx. 300 homes that is contiguous in nature. On this basis the area of Lime Street, Fisher Street, Bristol Street, Cardiff Street and Manlove Street were selected (see data in Figures A1.7.1-6), which have approx. 300 homes (see Figure 20)[43]. A walk around the neighbourhood was also carried out in June 2022 (see Figures 21-28).

[42] Meeting held with Rebecca Lane from the WMCA 13th June 2022

[43] Areas selected based on specific post codes - Lime Street (WV30EX, WV30EY, WV30HA, WV30HB), Fisher Street (WV30LF), Bristol Street (WV30HD), Manlove Street (WV30HG) and Cardiff Street (WV30EZ). Note that Dalton Street, Owen Road and Lea Road are not included in the housing figures in the street-level demonstrator and provide space to demonstrate other interventions.

Table 2: Shortlisted Pilot Investment Areas Assessment

Specific Streets (based on post code and LSOA data)	**Mean Heating Demand (per m2) / SAP Rating**	**House types and heating systems**	**Indices of Multiple Deprivation**	**Fuel Poverty**	**Nearby Streets / Amenities**
Area A - Bradmore Road, Hughes Avenue, Walford Avenue	Second highest demand. Highest mean domestic carbon emissions. Generally, SAP ratings are between C and F.	Mostly detached or terraced houses built before 1949. Mix of cavity and solid wall. Heating systems predominantly gas boilers.	Amongst the 40% most deprived neighbourhoods in the UK.	Area has a high number of fuel poor households.	Access to Bantock Park, and greener street environment. More limited access to schools and community assets.
Area B - Lime Street, Bristol Street, Dalton Street, Manlove Street, Owen Road, Burleigh Road, Bingley Street, Aston Street, Norfolk Road	Similar mean heating demand with Area A. High mean domestic carbon emissions. Generally, SAP ratings are between C and F in this area, with more dwellings than WV3 9B	It comprises mainly terraced and semi-detached houses, mostly built before 1929. Mostly solid brick walls. Heating systems predominantly gas boilers.	Amongst the 10% most deprived neighbourhoods in the UK.	Area has the highest number of fuel poor households.	Limited access to major green space, and poorer quality street environment. Nearby access to schools and community assets.

5.2 The street-level demonstrator area around Lime Street

Summary of key findings and conclusions

- The street level demontrator can showcase a replicable, scalable model for community led retrofit schemes that also enable the transition to sustainable lifestyles. The selected streets have similar building types that if retrofitted in contiguous clusters they could provide useful experience on the cost, coordination, supply chain and engagement required to achieve retrofit at scale.
- The area has a higher mix of private rented accommodation as part of its overall housing tenure. The demonstrator will test and prove the finance and management models required to instigate private investment and buy-in, leading to a fairer private rented sector. It will also build collaborations and trust between the LA and the private landlords that could benefit the quality of housing and the comfort of tenants.
- Most houses were constructed before 1930, with terrace housing with solid brick walls being the predominant building type. Over 200 homes in the area have SAP rating of D and E, with over 100 assumed to have no roof insulation.
- The estimated average heating demand per post code ranges from 140 to 160 kWh/m^2 (median 135 to 170 kWh/m^2). The estimated average current emissions are in the range of 3 to 5.5 tCO_2e.
- There is potential in the area for a mix of renewable energy generation in individual buildings and potentially as part of local networks
- Parts of the Lime Street area have 28% of households in fuel poverty. Parts of the Phase 1 area are within the 10% most deprived neighbourhoods nationally.
- St. Chads offers access to good quality open space to residents in the area. The quality of the street suffers from on-street parking, few street trees, and on-street bin storage.
- Public transport is within the catchment of households, and there are planned EVCP already to be installed.

Figure 20: The street-level demonstrator area around Lime Street

© Arup

Figure 21: St Chads Open Space is well used by the community

© Arup

Figure 22: Some properties have original wooden windows

© Arup
Figure 23: Few houses have external wall insulation

© Arup
Figure 24: Evidence of traffic calming with lack of green infrastructure on estate roads.

© Arup
Figure 25: Owen Road is a focal point with shops and some basic urban realm

© Arup
Figure 26: Vacant building on corner of Cardiff St and Dalton Road Some fly tipping evidence

© Arup
Figure 27: Gated alleyways lead to bins being stored on the street

© Arup
Figure 28: Few houses have front gardens, with mostly on road parking. Poor overall street scene experience

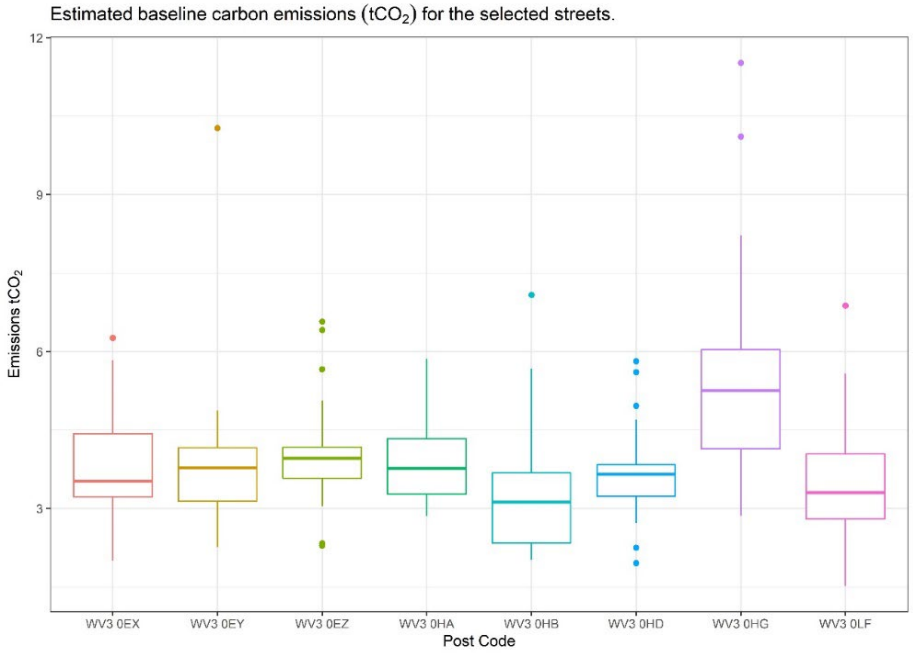
5.3 Street-level demonstrator - emission profile

Summary of key findings and conclusions

- The carbon abatement potential is not directly proportional to the total cost of the interventions. Low-cost measures with high emissions reduction potential and low disruption to tenants, such as roof insulation in uninsulated roofs, are typically installed first. The impact of the measures has a cumulative effect.
- In comparing scenarios to achieve 50 kWh/m^2 or 90 kWh/m^2, there is a £3 million cost difference to achieve an additional 13 tCO_2e reduction. The difference is mainly due to the amount of glazing, internal party wall and floor installation measures required.
- The measures with the lowest cost £/kgCO_2e saved were found in this assessment to be roof insulation, Air Source Heat Pump (ASHP) installation, and external solid brick wall insulation.
- The scenario proposed in this plan had the lowest abatement cost £6,110 per tCO_2e. The total emissions saved were 212 tCO_2e.
- This plan considers the contribution of currently available funds and others available for retrofit measures that would be necessary to achieve the engagement and coordination needed to complete retrofits in this scale, enable sustainable lifestyles and scale out to the Ward effectively.

Houses in the street level demonstrator area emitted 1.2 $ktCO_2e$ from domestic energy consumption according to SAP modelling[44]. Post code aggregated consumption data from BEIS for 2020, indicated domestic gas consumption of 3.9 GWh (705.3 tCO_2e) and 0.66 GWh electricity consumption (154.5 tCO_2e). The range and distribution of the estimated carbon emissions in post codes (Figure 29), showed that houses in Manlove Street (WV3 0HG) are among the highest carbon emitters in the street-level demonstrator.

Figure 29: Estimated domestic energy related carbon emissions (tCO_2e) for houses in the street-level demonstrator (Parity Projects 2022)

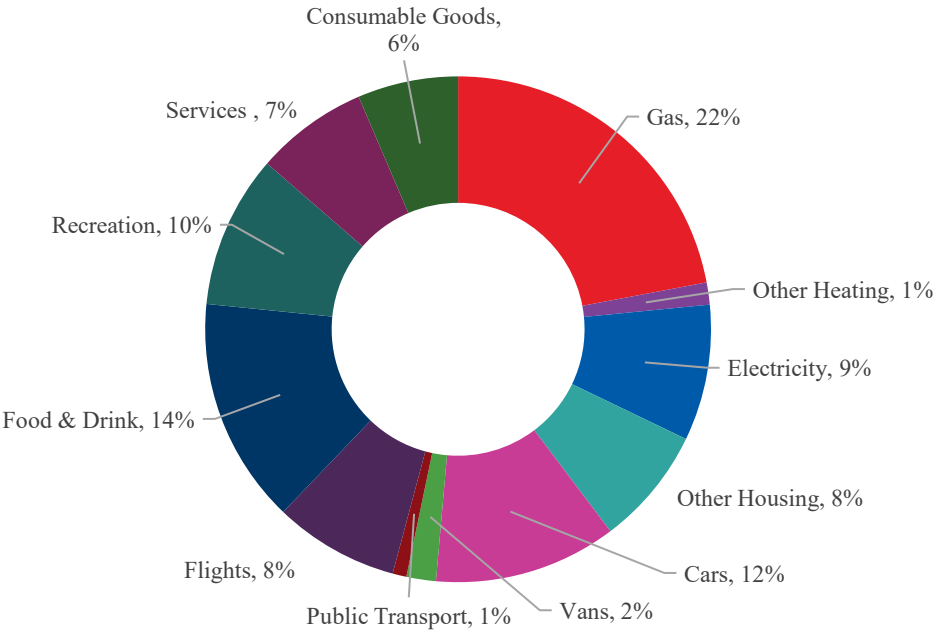


According to the Place-based carbon calculator (Figure 30) emissions modelling for 2018, the carbon emissions footprint of the street-level demonstrator area shows a large share of emissions from lifestyle choices and everyday living activities. While energy related emissions and transport accounted for almost half of the emissions, there is a considerable number of emissions from recreation and consumer choices.

[44] 300 dwellings data source in Parity Projects 2022

This points out the importance of educational programmes and behaviour change to enable a transition to more sustainable, low-carbon lifestyles.

Figure 30: Carbon emissions footprint for the street-level demonstrator area according to share of emissions in different activity categories (Source: Place-based carbon calculator[45])



5.3.1 Pathway to net zero in the street-level demonstrator

The Capital Investment Plan (see section 6) distributes the available £1.65 million into interventions that could create a paradigm of net zero community transformation. Most of the funding is allocated on capital projects with a focus on the retrofit of houses. Scenario NZN in Table 3 provides an overview of the cost and emissions saved with the "deep retrofit" of 15 houses and low disruption measures with high bill savings and good emission saving potential spread over 114 properties.

Table 3: Retrofit scenarios for the street-level demonstrator and its impact on emissions (Source: Parity Projects Pathways Scenarios 2022)

Retrofit scenarios and their impact on emissions (300 dwellings)						
	Emissions before (tCO_2)	**Emissions after (tCO_2)**	**Emissions saved (tCO_2)**	**Cost**	**Abatement cost (£/tCO_2)**	**Houses retrofitted**
Scenario NZN	1200	988	212	£1,295,300*	£6,110	129
Scenario 50kWh/m² heat demand	1200	141	1059	£10,000,000	£9,443	300
Scenario 90kWh/m² heat demand	1200	154	1046	£7,000,000	£6,692	300
Scenario SAP C	1200	695	505	£4,000,000	£7,921	300

*Cost of scenario before any grants.

[45] Morgan, Malcolm, Anable, Jillian, & Lucas, Karen. (2021). A place-based carbon calculator for England. Presented at the 29th Annual GIS Research UK Conference (GISRUK), Cardiff, Wales, UK (Online): Zenodo.

6. Capital Investment Plan

Summary of key findings and conclusions

- The Capital Investment Plan sets a clear strategic direction for achieving net zero in Graiseley, this translates into a portfolio focused on: community energy and retrofit, sustainable mobility, green infrastructure, circular practices, underpinned by a community engagement programme as well as studies that will enable technical and financial scaling up
- A representative selection of projects and initiatives from the plan will be implemented in a street-level demonstrator area, which will assess and prove the effectiveness and impact of the wider net zero approach
- The proposed funding and financing strategy sees a gradual transition from the reliance on grant funding (phase 1, 22-24) to a blended finance approach, which leverages outcome-seeking capital and short to long term investments (i.e. local green bonds, revolving funds)
- The allocation of the WMCA's £1.65m fund should play a central role not only in implementing impactful (retrofit) projects, but also in increasing the uptake of existing funding schemes (i.e. LAD3), supporting the delivery of a representative sample of projects across multiple sectors, and running the operational activities that will ensure the Plan is people-centred and scalable
- Thanks to the WMCA fund and matching grants, Phase 1 could see the delivery of both deep retrofit (on 15 units) and targeted, low disruption retrofit across the street-level demonstrator (114 units), together with the implementation of sustainable mobility and green infrastructure measures (i.e. traffic calming and public realm improvements, bike infrastructure, increase of tree cover and community allotments). These capital interventions will be enabled by operational activities across community engagement, programme management and research initiatives.
- Phase 1 will also be dedicated to exploring the viability of financial instruments that will ensure the future phases' financial sustainability

6.1 Ward-wide Strategy

6.1.1 Proposed projects and initiatives by sector, and related co-benefits

Transforming Graiseley into an inclusive NZN requires a coordinated approach driven by a clear strategic direction and underpinned by an ambitious programme of interventions. This will frame the projects selected for the first phase (Street-Level Demonstrator).

Building on the overarching approach to Net Zero (section 3.4) and on the analysis of local assets and policies (section 4) we have developed a comprehensive plan that outlines tangible actions under the following **sectoral strategies**:

- Implementing community retrofit and energy interventions at scale,
- Providing the enabling infrastructure for electric mobility,
- Supporting a mode shift to active mobility, also through the provision of a safer and high quality public realm,
- Delivering heathier and greener public spaces,
- Trialling flagship initiatives to encourage the uptake of circular economy practices

The long-list of projects prioritises **avoiding** the production of new emissions, and the **reduction** of existing ones, but also offers measures to convert existing energy sources and deliver local carbon removal through nature-based solutions. The range of initiatives also incorporates and **leverages the ongoing initiatives** in Graiseley and across Wolverhampton (see also Section 4 – Understanding Local Assets), this is the case, for instance, of charging points for EVs, the installation of LED street lighting, or the Tiny Forest scheme.

Community engagement initiatives underpin each sectoral portfolio of projects. These are a crucial element to ensure the success and sustainability of the demonstrator, and include consultation, training and co-creation and production. Community engagement will also play a substantial role in helping tackle

consumption-based emissions through **behaviour change**, while engagement with the local supply chain will help reduce embodied emissions in capital project such as housing retrofit.

The proposed actions have the potential to yield a range of **economic, environmental and social co-benefits**. These span from improved health and wellbeing to financial benefits for owners and residents, as well as positive environmental and adaptation-related impacts.

The plan envisages the development of activities that will enable the **scaling up** of the demonstrator, both from a technical and financial perspective. The development of a data-driven approach to monitoring and evaluation, for instance, can help prove the effectiveness of the pilot projects, supported with evidence from community engagement. The unique innovation ecosystem of Wolverhampton, especially in the field of sustainable construction, could play a pivotal role in creating a "Living Lab" environment, connecting research and upskilling between the local supply chain, workforce, and residents. Lastly, the study of blended finance instruments completes the suite of initiatives aiming at ensuring the replicability and long-term sustainability of the demonstrator (see also section 6.3 – Funding and Finance Options).

Figure 31: Illustrative Interventions for Graiseley Ward

Figure 32: Proposed Ward-wide Interventions

Sector	Strategy	ID	Project	Net Zero Potential: Avoidance	Net Zero Potential: Reduction	Net Zero Potential: Conversion	Net Zero Potential: Compensation	Co-benefits: Economic: Lower energy bills	Economic: Reduction in fuel poverty	Economic: Lower maintenance costs	Economic: Increased property value	Economic: Amenity value	Economic: Support local value chains	Co-benefits: Environmental: Better air quality (indoor)	Environmental: Better air quality (outdoor)	Environmental: Acoustic comfort	Environmental: Higher flood resilience	Environmental: Decreased overheating	Environmental: Higher biodiversity	Co-benefits: Social: Better physical health	Social: Increased physical activity	Social: Better mental health	Social: Higher safety and security	Social: Learning/training opportunities
Buildings	Community Retrofit	1a	Retrofit: replacing windows		●			●	●	●	●	●	●	●		●		●		●		●	●	
			Retrofit: external / internal wall insulation		●			●	●	●	●	●	●	●		●		●		●		●	●	
			Retrofit: roof insulation		●			●	●	●	●		●			●		●		●		●		
			Retrofit: floor insulation		●			●	●	●	●		●	●						●		●		
Energy / Heating	Community Energy Schemes	2a	Smart metering + app		●			●	●															
		2b	Solar PV on roofs		●	●		●	●		●		●											
			Solar thermal		●	●		●	●				●											
			Air source heat pumps		●	●		●	●				●											
		2c	Local Energy Network		●	●		●	●															●
Transport	Infrastructure for e-mobility	3a	Expand EV charging provision*		●	●		●	●						●									
			Electric bike / e-scooters rental scheme	●		●									●					●	●			
	Encouraging active mobility- safer public realm	3b	Shared surface	●								●									●		●	
			Widening of pavements, increasing seating provision	●								●									●		●	
			Wayfinding / Legibility project	●								●											●	
			Increase / Better quality street lighting - Extend LED Lighting*		●					●		●									●	●	●	
		3c	Segregated cycle lanes	●								●								●	●	●		
			Bike storage facility	●																●	●	●	●	
			Bike sharing docking stations*	●																	●			
		3d	20mph zone & one way streets		●										●	●					●	●	●	
Environment	Healthier and greener spaces	4a	Green walking route				●								●	●			●	●	●	●	●	●
		4b	Increase tree cover (ie. Tiny Forests)*				●				●	●					●	●	●	●	●	●		
			Pocket rewilding				●				●	●					●	●	●	●		●		
		4c	Sustainable urban drainage		●		●			●		●					●	●	●			●	●	
		4d	Community allotments*				●								●					●		●		●
Waste	Circular Economy	5a	Circular economy hub (repair, reuse, recycle)	●	●	●	●						●		●									●
Community	Greener spaces	6a	Community allotments - engagement activities*	●																	●	●		●
	Housing retrofit / reducing consumption	6b	Training and user manual to retrofitted home		●			●		●														●
			Engagement on the benefits of retrofit		●																			●
			Co-design workshops on architectural aspects of retrofit		●																			●
		6c	Social Enterprise set-up		●	●	●																	●
	Active mobility	6d	Walking and bike bus	●																●	●	●	●	
	All	6e	Community net zero hub for information/getting involved	●	●								●											●
Project Management		7a	Project Management and Delivery allowance	●	●	●	●						●											●
Study		8a	ie. SOBC, engagement for exploring financial instruments	●	●	●	●																	

*Initiatives ongoing either in Graiseley or elsewhere in proximity

6.2 Proposed interventions in the Street-Level Demonstrator

The Street-Level Demonstrator offers the opportunity to implement a representative sample of the projects and initiatives to that will support Graiseley's pathway to Net Zero. Thanks to its location in the Ward, its physical features and the socio-economic characteristics of its residents, the defined area offers the greatest potential to deliver projects across all sectors, demonstrating the viability of the concept.

The most suitable projects for the pilot were selected based on a principle of **spatial fit** and **effectiveness**.

- Spatial fit: compatibility with the typology of urban fabric / spaces
- Effectiveness: projects able to yield benefit at the scale of the street level demonstrator (ie. this excludes, for instance, projects reliant on building a network, such as cycle lanes)

Figure 33: Proposed Street-level Demonstrator Interventions

Sector	Strategy	ID	Project	Net Zero Potential: Avoidance	Reduction	Conversion	Compensation
Buildings	Community Retrofit	1a	Retrofit: replacing windows		●		
			Retrofit: external / internal wall insulation		●		
			Retrofit: roof insulation		●		
			Retrofit: floor insulation		●		
Energy / Heating	Community Energy Schemes	2a	Smart metering + app		●		
		2b	Solar PV on roofs		●	●	
			Solar thermal		●	●	
			Air source heat pumps		●	●	
Transport	Infrastructure for e-mobility	3a	Expand EV charging provision*		●	●	
	Encouraging active mobility- safer public realm	3b	Shared surface	●			
			Widening of pavements, increasing seating provision	●			
			Wayfinding / Legibility project	●			
			Increase / Better quality street lighting - Extend LED Lighting*		●		
		3c	Bike storage facility	●			
			Bike sharing docking stations*	●			
		3d	20mph zone & one way streets		●		

Sector	Strategy	ID	Project	Net Zero Potential: Avoidance	Reduction	Conversion	Compensation
Environment	Healthier and greener spaces	4b	Increase tree cover (ie. Tiny Forests)*				●
			Pocket rewilding				●
		4c	Sustainable urban drainage		●		●
		4d	Community allotments*				●
Community	Greener spaces	6a	Community allotments - engagement activities*	●			
	Housing retrofit / reducing consumption	6b	Training and user manual to retrofitted home		●		
			Engagement on the benefits of retrofit		●		
			Co-design workshops on architectural aspects of retrofit		●		
		6c	Social Enterprise set-up		●	●	●
	Active mobility	6d	Walking and bike bus	●			
	All	6e	Community net zero hub for information/getting involved	●	●		
Project Management		7a	Project Management and Delivery allowance	●	●	●	●
Study		8a	ie. SOBC, engagement for exploring financial instruments	●	●	●	●

The map and street illustration below show how the selected interventions interact and contribute towards supporting lower carbon lifestyles and enhancing quality of place. The linear nature of the many of the proposed solutions (i.e. Sustainable Urban Drainage (SUDs), public realm improvements), together the type of urban fabric (terraced houses), allows to maximise the residents' proximity to all interventions. The "focus areas" highlight the zones within the demonstrator which have the potential to display the highest variety of interventions across all sectors. *Manlove Street could be prioritised for deep retrofit*, due to the high mean heating demand and high mean carbon emissions (A1.6.5 & A1.6.6), and many houses that all have uninsulated solid brick walls, uninsulated roofs with SAP ratings E and F.

Figure 34: Illustrative Interventions in the Street-level demonstrator

*to be implemented at a later stage as part of the wider ward-level interventions

Figure 35: Illustrative Interventions for Graiseley

6.2.1 Domestic carbon abatement interventions – Street-Level Demonstrator

The number of houses that could be eligible for different measures was assessed based on assumptions for the house type and construction as used in the SAP modelling (Parity Projects 2022). For reference, the 50 kWh/m^2 heating demand Scenario was selected because it was considered to show the maximum potential for retrofits in the area. The capital costs shown in Table 4 include a +25% optimising bias, that accounts for overheads, works coordination, uncertainty with material prices and labour costs and inflation. The street-level demonstrator could showcase how such retrofit schemes can be efficiently managed and the reveal any issues with engagement, costs, and actual savings in comparison with the modelling results. A detailed version of Table 4 is also available in Appendix A.2. The average bill savings will depend on electricity and gas prices, increasing prices would mean bigger savings for the households.

Table 4: Number of houses eligible for different retrofit measures, estimated emissions, and indicative bill savings.

Intervention	Applicability – n. of units*	Assumed capital costs^^ per measure	Avg. $kgCO_2e$ reduction per measure	Avg. Bill savings per household per year	Cost per $kgCO_2e$ reduced per measure	Disruption during installation
Roof - Loft insulation (uninsulated)*	129	£1,000	940	£160	£1.1	Low
Roof - Loft insulation (top-up)*	133	£813	95	£20	£8.6	Low
External solid brick wall insulation*	266	£10,125	975	£170	£10.4	Medium
Suspended floor insulation*	149	£2,000	180	£30	£11.1	High
Solid floor insulation*	146	£2,000	140	£30	£14.3	High
Double glazing A+*	291	£7,625	280	£50	£27.2	High
ASHP*	300	£15,000	1,500	-£35	£10.0	Medium - High
Solar PV ** (rooftop) (~2kW$_P$)	119 (assumed)	£5,000	365	£325	£13.7	Low
Solar thermal *** (Hot Water)	119 (assumed)	£5,625	343	£140	£16.4	Low

*Data Source: Parity Projects Database, 50kWh/m^2 heating demand Scenario.
**Source: see section 4.4.3
***Source: https://cat.org.uk/info-resources/free-information-service/energy/solar-water-heating/ for example.
^^Capital cost include a +25% optimising bias (e.g. overheads, uncertainty with material prices, inflation etc.)

6.3 Funding and finance options

6.3.1 Strategy

6.3.1.1 Funding and financing options and sustainability

Funding and financing of a Net Zero Neighbourhood requires committed resources with added flexibility to overcome unanticipated project variability and differentiation, as well as cash-flow constraints. As a result, this requires a ***blended-finance*** approach whereby both traditional public and private sector funding and financing is combined and applied to create a re-financeable fund, but also less conventional funding approaches are explored and utilised. Table 5 below provides a high-level reflection of these funding and financing options:

Table 5: Comparison of funding and financing options

Funding / financing source	Definition	Examples	Level of risk investor is willing to take	Cost of capital (to CWC)	Re-payment via	Timeline of investment	Quantum of capital
Public Grant Funding	National government provided funding	Social housing decarbonisation fund, Heat Pump Subsidy Scheme, Green Heat Network Fund, etc.	Medium	N/A	N/A	Immediate	Small to medium
	Local government (on-budget[46]) provided funding	CWC NZ or other related grants.	Low	N/A	N/A	Immediate	Small
(Private) Commercial Short-term finance	2-5 years debt or equity usually used as interim or bridging finance. Purely profit driven	Financial institutions, Development banks (UKIB), DFI's, etc.	Medium to High	High	Re-financing through L-term finance	Immediate and short-term	Small to medium
(Private) Commercial Long-term finance	30-40 years+ debt or equity. Used to refinance the initial up-front capital provided by s-term finance. Profit and possibly outcomes driven	Local "green" bonds and other borrowing by LA (eg: PWLB), Infrastructure and Real Estate funds, Pension funds, Wealth funds, etc.	Low	Low	Utility bills (cost savings)[47]	Long-term	Large
(Private) Outcome seeking capital providers	Provide capital investment on the basis of achieving a specific outcome (eg: emissions reducing infrastructure)	Philanthropy, Corporates (ESG targets or other incentives), Foundations, etc.	High	N/A	N/A	Medium to long-term	Small to medium

A foundational point for funding a NZN is that the programme whole is greater than the sum of its parts. In other words, leverage is key. Without private sector participation, public sector funding would be inadequate

[46] "on-budget" is used to provide a distinction between funds generated via services provided or national share of revenue, as opposed to local government borrowings - which are covered under long-term financing

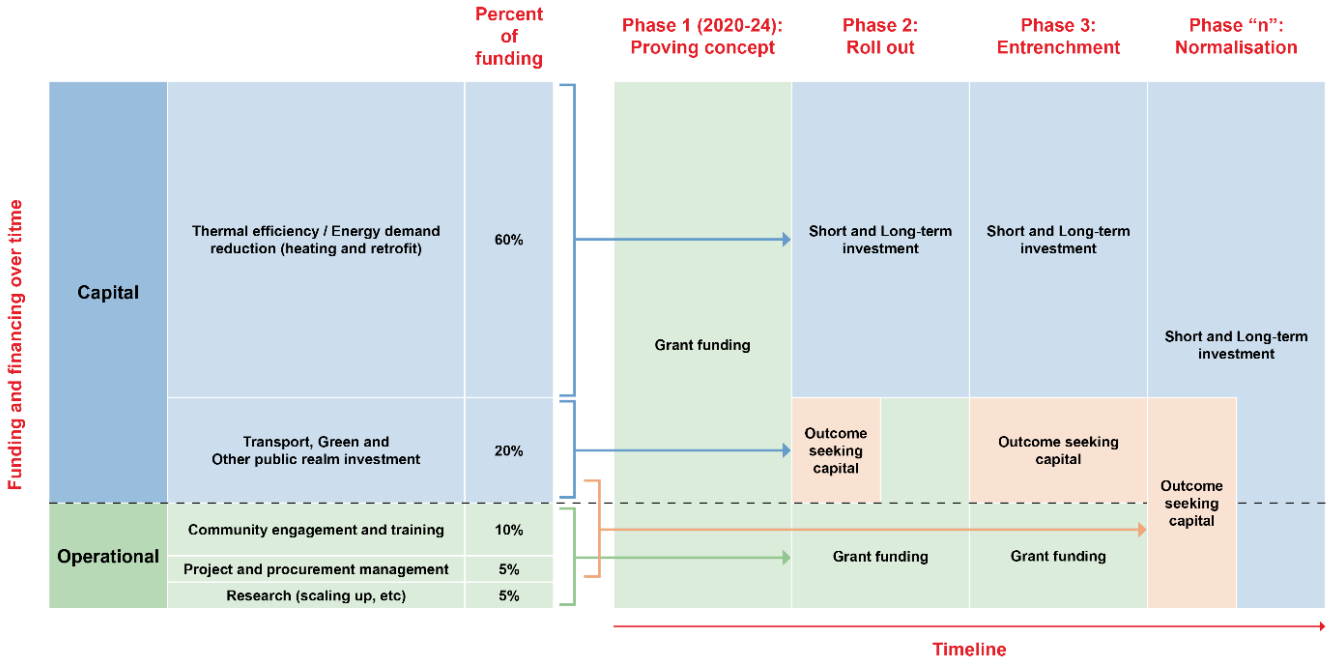
[47] If cash-flow from utility bill cost savings is inadequate, the lender may require guarantees from LA's. Thus repayment could come from LA's general revenue pool

to generate a holistic and sustainable NZN programme. Key to this is, 1) private sector buy-in, into the objective of the programme, 2) identifying revenue generating assets within the NZ approach (for repayment purposes), and 3) ensuring that a reasonable rate of return is possible (for long-term finance, this is relatively low). There is a quid-pro-quo in that public sector funding has a role for proving concept and de-risking the programme/project, further giving confidence to the private sector financiers.

To illustrate this, Figure 36 below reflects on a potential funding strategy/allocation for the proposed programme over time, split into 4 Phases:

- In the initial demonstrator ("proving concept") phase **(Phase 1, 2022-2024),** a pilot with a clear implementation and management plan is identified. Because the project is novel to the market, this would most likely be fully funded from a combination of local and central government subsidies (grant funding) in order to prove the concept. A review of the existing funding schemes and their applicability to the demonstrator can be found in Appendix A.3.
- Once the concept is proven, **Phase 2** would mean a holistic rollout across the ward on a programmatic and systematic basis. The programme is still in its infancy and would still require significant public sector funding (grant funding) for de-risking and non-revenue generating interventions (eg: tree planting, on-road cycle lanes, etc.) and operations (project management, research and community engagements and education). However, at this stage, other funding may be available, including outcome seeking investments which could help cover the cost on non-revenue generating interventions. Significantly, private sector (commercial) finance would now be available to 1) cover any cash-flow short-falls (short-term finance) as well as long-term financing which would 2) provide capital investment for revenue generating interventions (ie: interventions that derive lower energy demand (such as a combination of heat pump installation, fabric retrofit, etc.) and therefore (utility bill) cost savings, which are used for repayment of the investment).
- By **Phase 3**, where the programme is entrenched in the system, grant funding may only be required for operational activities, whereas outcome seeking investment and commercial finance is readily available for capital investment, and re-financed over the life of the programme and project.
- By **Phase "n",** where the programme is normalised as part of conventional LA programmes and operations, grant funding *may* fall out completely, and outcome seeking capital and commercial investment are able to cover all aspects of the current and future projects, as a result of replicability (lowers risk), scalability, and efficiency gains (which reduce cost and increase margins).

Figure 36: Funding and financing strategy over time



6.3.1.2 Phase 1: Allocation of the £1.65 million funding

The £1.65 million funding represents the opportunity to maximise the impact and visibility of the demonstrator, as well as enabling the transition to the future phases ("Roll-out" to "Normalisation"). Table 6: Funding allocation objectives sets out the guiding principles for prioritising and allocating the funds.

Table 6: Funding allocation objectives

Type of expenditure	Objective	Example application
Capital	To fund projects that allow to maximise impact in terms of emission avoidance and reduction	*Housing retrofit / energy projects*
	Making interventions cost-free for residents (ie. match-funding existing grants)	*LAD3 / HUG*
	Allowing to implement a representative sample of community-scale projects, including project not currently covered by existing funding	*Active mobility, green infrastructure projects*
Operational	Funding community based initiatives currently not covered by other funds	*Co-design, training*
	Funding initiatives / studies that will enable scaling up and enable financial sustainability	*Study of green bonds, setting up Community Fund, etc.*
	Funding programme management and delivery costs	

Aligned with the principles set out above, Table 6 provides a strategic allocation framework for the £1.65 million of WMCA funding available for the demonstrator.

Residential interventions that improve thermal efficiency and lower energy demand are expected to provide important emissions reductions (particularly roof and wall insulation and the replacement of gas boilers with heat pumps). As a result, the largest component (c.60%) of the funding should be allocated to these types of interventions, while at least 20% should be allocated to green infrastructure and/or some form of active travel or EV intervention (although this may be too small to derive any significant benefits such as lower emissions or carbon sequestration benefits).

In addition, due to the novelty of the demonstrator, at least 20% of the available allocation should be used for operational activities including, community engagement and education, programme management and oversight and other related items such as research, monitoring, etc.

As a caution, it should be noted that the while the funding allocation reflects a hierarchy of priorities, the operational items will realistically require additional funding sources to be implementable. As explained in section 7, the programme operational functions will start modestly and seek further funding opportunities to scale-up delivery capability to support the capital interventions. Initially and whilst funding is sourced, CWC will utilise internal resources to off-set the gap in operational funding.

Table 7: Funding allocation by project portfolio and proposed preliminary distribution

Funding allocation by project portfolio			Available funds	£1,650,000
Capital	80%	Residential – Fabric first retrofit (insulation)	30%[48]	**£495,000**
		Residential - Energy / Heating (heat pumps and central heating upgrades)	30%	**£495,000**
		Transport and public realm uplifts	10%	**£165,000**
		Green infrastructure	10%	**£165,000**
Operational	20%	Community engagement & education	10%	**£165,000**
		Programme management and oversight	5%	**£82,500**
		Research (scaling up, etc.)	5%	**£82,500**

6.3.2 Phase 1: Proposed Interventions

The proposed funding allocation for Phase 1 would enable the delivery of a comprehensive range of interventions related to retrofit/energy decarbonisation, together with a representative sample of projects across the other sectors (Table 7) and funding allocation from different sources.

Phase 1 also includes the set-up and kick-off of the full range of community engagement initiatives shortlisted for the street level demonstrator (see Section 7 and 8 for further detail).

6.3.2.1 Community retrofit and energy schemes projects

The proposed allocation of funds for Phase 1 would allow to:

- demonstrate deep retrofit for up to 15 units in the demonstrator, and
- deliver targeted, low disruption retrofit (roof insulation and installation of solar PV) for 100% of the remaining compatible units (114)

This combined approach has the benefit to both demonstrate the benefits of a comprehensive set of retrofit measures (roof, floor and external wall insulation, A+ double glazing, ASHP and solar PV) in a "whole building" approach, as well as implementing lighter improvements in the maximum possible number of houses. The proposed approach also complements existing alternative funding streams (LAD3), making the intervention contribution-free and more appealing for landlords[49].

Roof insulation and solar PV were prioritised as part of the partial retrofit package of interventions as they have high-cost effectiveness in terms of CO_2 reduction potential per £ spent, they are among the least disruptive typologies of retrofit intervention, and they can lead to big bill savings.

[48] Please note this preliminary distribution should be read as a guidance. For an estimate of costs based on quantities applicable to the street-level demonstrator area, see section 6.3.2

[49] It however recommended that this specific use of the subsidy is subject to further consideration and engagement as it would favour in the short term a limited number of private landlords.

Table 8: Community retrofit and community projects to be delivered in Phase 1.

Intervention	n. Dwellings	Cost* / dwelling (£)	Total Cost (£)	LAD3 Contribution (£)***	Funding Gap (Allocation from the £1.65M fund)	Total tCO_2e reduction (2022)	Avg. bill savings / dwelling pa (£)	Selection Criteria / Location
Deep retrofit (Roof + external wall insulation + floor insulation + A+ Double Glazing +ASHP + Solar PV)	15	40,750	611,300	111,000	500,300	63.6	700	SAP E-F, solid brick walls, uninsulated roofs, boiler C&E rated systems, old double and part single glazing. (WV3 0HG) Manlove Street: 13 + 2 Lime Street (WV3 0EX/0HA)
Targeted, low disruption retrofit (Roof - $Loft_{uninsulated}$ + Solar PV)	114	6,000	684,000	-	684,000	148.8	485	Uninsulated roofs ideally with South, South-East/West orientation. Street-Level Demonstrator area wide
Total			**1,295,300**		**1,184,300**	**212.4**		

* Sources: Cost and Impact data for building retrofits (other than solar PV and solar thermal) were calculated through Parity Projects (https://parityprojects.com/) CWC dashboard. Cost is indicative of the installation of proposed measures, including materials and labour for non-complicated cases. Cost does not include works such as floor replacements, old insulation removal or other works and relocations that might be necessary for the installation of the measures. A 25% optimism bias was applied on construction costs to consider potential increases related to inflation, increases in cost of materials, works coordination, uncertainty in relation with labour costs etc.
*** It was assumed a £5,000 contribution for landlords and a £10,000 contribution for homeowners / occupiers.

6.3.2.2 Transport and environment projects

The proposed allocation also supports the implementation of:

- Representative projects aiming at improving public realm, supporting active transport and creating greener and more resilient spaces
- Community engagement initiatives that complement retrofit and mobility projects
- Part-funding the management of the programme and the exploration of technical and financial solutions for scaling up

Table 9: List of transport and public realm projects to be delivered in Phase 1

Intervention	Quantity	Total cost (£)	Source of funding	Funding gap (allocation from £1.65m fund)	Assumptions [a]
Expand EV charging provision	5 EVCP	10,000	CWC (through the On Street Residential Vehicle Charging Scheme)	-	CAPEX is dependent on the specifications of the charging point and depend mostly on the speed of charge: >£500 if Standard, >£6000 if Fast and >£45000 if Rapid The recommendations for installations are that Standard should be used for residents, workplaces, Fast for destination hubs like retail outlets and visitor parking and Rapid should be used for delivery services, taxi ranks or car clubs.
Increase / Better quality street lighting - Extend LED Lighting	25 LED Lights	37,500	CWC (Ongoing deployment across Wolverhampton)	-	LED standard lighting columns: £1,000-£2,000 to replace and install
Bike storage facility (cyclehoop type)	4 facilities	23,000	WMCA	23,000	£5000 per facility and a 15% construction cost uplift was applied to account for installation cost
20mph zone	2 streets – (Lime St. 300m, Fisher St. 170m)	5,875	WMCA	5,875	£10,000 – £15,000 per km including traffic calming measures
One way streets	2 streets – (Cardiff St., Manlove St., 150m each)	3,750	WMCA	3,750	£10,000 – £15,000 per km including traffic calming measures
Total - Transport		**80,100**		**32,600**	

[a] All costs based on Arup project precedents, unless otherwise stated

Table 10: List of environmental (green infrastructure) projects to be delivered in Phase 1

Intervention	Quantity	Total cost (£)	Source of funding	Funding gap (allocation from £1.65m fund)	Assumptions
Increase tree cover (i.e., Tiny Forests)	150 sqm	15,850	CWC (extension of the Tiny Forest programme)	-	(b)
Pocket rewilding	120 sqm	-	CWC	-	Assumed to be negligible
Community allotments	1	-	Graiseley and District Co-operative Allotment Society	-	
Sustainable Urban Drainage	329sqm (alongside Manlove st, Fisher st, Cardiff st)	10,111	WMCA	10,111	(c)
Sustainable Urban Drainage – Permeable pavement	846 sqm (Manlove st, Fisher st, Cardiff st)	47,893	WMCA	47,893	(c)
Remediation of existing pavement and road	1175 sqm (Manlove st, Fisher st and Cardiff st.)	49,176	WMCA	49,176	(d) Assumptions were made that the labour costs were included in estimations. A blanket cost for general site clearance of £3/m^2 was applied to account for miscellaneous item removals which are not included e.g. breakup and removal of road surfacing. An annual inflation rate of 2.0% since 2010 was applied to all costs, in line with Bank of England guidance.
Total - Environment		**123,050**		**107,200**	

[a] All costs based on Arup project precedents, unless otherwise stated

[b] The Cost of Everything Podcast. 'The Cost of a Tiny Urban Forest', 3 May 2021. https://thecostofeverything.net/2021/05/03/the-cost-of-a-tiny-urban-forest/ and 'Twin Your Tree FAQs'. Accessed 28 June 2022. https://earthwatch.org.uk/twin-faqs

[c] "Cost estimation for SUDs - summary of evidence" DEFRA, Environment Agency 2015

[d] Worcestershire Council Highway Schedule Rates 2010

6.3.3 Funding and finance options to be explored over the next phases

Phase 1 of the demonstrator – Proving the Concept should also aspire to explore and set up alternative sources of finance, including forms of short- and long-term investment, as well as outcome-seeking capital.

In the following pages we outline a selection of financial instrument that we plan to investigate in the 2022-24 period. Some of these are relatively innovative forms of finance and their design will require additional research and extensive engagement with communities and investors alike. We describe here a number of successful applications and the opportunity for implementing similar initiatives to help support the delivery of the Demonstrator in Graiseley.

Table 11: Financial Instruments Case Study - Local Green Bonds

Financial Instrument	Local Green Bonds
Case Study	West Berkshire Community Municipal Investment
Mechanism	Community Municipal Investment are bonds issued by the council corporate body and administered by a regulated crowdfunding platform. The bonds are available for purchase by local residents and general investors. The capital is then invested in the delivery of local Net Zero infrastructure project. This type of local green bonds allows for the immediate and transparent investment of the capital into selected projects which usually form part of the council's Net Zero Strategy and Action plan. Local Climate Bonds (LBCs) allow Local Authorities to create interactions with their local community while diversifying their sources of funding and help meet net zero targets. LBCs are designed to be priced below the prevailing Public Works Loan Board (PWLB) rate at the time of issuance which presents an advantage for the councils taking part.
Where it has been applied before / how it worked	Summer 2020, £1million raised through 640 investors nationwide for a 5-year investment at 1.2% IRR. 23% of total investment coming from West Berkshire residents. The bonds issuance and return payments are managed through a platform called Abundance Investment, a green finance, FCA regulated investment platform. April 2021, 15% of investors donated their returns from investment back to the fund to be invested into the Wildflower Verge project. Funding used to implement schemes from the West Berkshire Environment Strategy. £520,000 invested in 6 different solar PV roof-based projects on council facilities: school, leisure centre, care facility and council offices £310.4k was paid in returns to investors. Newer iteration of the LGB scheme have been issued with an additional system of peer to peer loan, giving the opportunity for the investment to be held in an Innovative Finance ISA. This allows the individual investors to access the ISA tax benefit on their investment and enables the council to reach the £650 billion ISA market of individual investors.
Opportunities to be explored in Graiseley	Retrofit, solar development and returns re-invested could be used for other smaller projects like biodiversity enhancement, pedestrianisation, EVCP deployment, micro-mobility / community car clubs. The funding mechanism also allows for people to invest as little as £5 into the scheme, making it accessible to most which could be a great advantage in Graiseley. This also favours a new way of communication and relationship between the council and the community, based on a common goal.

Table 12: Financial Instruments Case Study – Co-operative and Community Share Offers

Financial Instrument	Co-operative underpinned by Community Share Offers
Case Study	South East London Community Energy Co-op (Selce)
Mechanism	The co-operative partners with institutions which own south facing roofs in south-east London like schools, leisure centres, council office. Community Share Offers are released in rounds and bought by members of the community or anyone who is interested in the project. Coupled with the solar subsidy from the government, the money raised is used to buy and install solar panels which are owned by the co-operative. Investors receive annual interest on their investment as well as a possibility to remove their capital at the end of the investment period. The co-operative runs the solar panels, benefitting from the Feed-In Tariffs (FIT) scheme* which is guaranteed for periods of 20 years by the government. The investment is therefore low risk, being underpinned by governmental guarantees.
Where it has been applied before / how it worked	South-East London Community Energy Co-op was created in 2014. It has raised £500,000 so far, to install solar arrays on a selection of community buildings. The investors which have purchased shares in the co-operative solar projects through the Community Share Offers are being paid a annual return on investment of 3-4% of their initial investment. The co-operative refunds the investment in full after 20 years. The solar arrays power community buildings throughout the project area, helping Lewisham and Greenwich to move away from fossil fuel consumption. The profit made from running the solar panels on a Feed In Tariff underpinned by the government is then reinvested by the co-operative in community projects like financial and energy planning workshops or offering advice to local residents on how to make their homes more energy efficient through behaviour change and retrofit measures such as loft-insulation or heat-pump installation.
Opportunities to be explored in Graiseley	The funding mechanism relies on the participation of 'Solar partners'. Usually institutional organisations, the partners accept to have their buildings fitted with solar arrays. This type of initiative offers this opportunity to raise awareness around solar solution in Graiseley. This initiative also funds workshops to help the community better manage their energy bills and help address fuel poverty.

*It is worth noting the FIT scheme is no longer operative, however Octopus Energy is currently offering a "smart export tariff" scheme (Outgoing Octopus) – see also: https://octopus.energy/outgoing/

Table 13: Financial Instruments Case Study – Community Trusts

Financial Instrument	Community Trust
Case Study	Saffron Lane Neighbourhood Council Community Trust
Mechanism	Development of affordable and social housing with a partner Housing Association and retention of the rent into a trust for community benefits.
Where it has been applied before / how it worked	Saffron Lane Neighbourhood Council built a case and asked Leicester City Council to give them 13 acres of derelict land adjacent to their own community garden. The council accepted and sold them the land for £1. Saffron Lane NC built 68 affordable homes to Passivhaus standards on the site, through a partnership with a local Housing Association East Midlands Housing (emh) and a local developer, Westleigh. The houses were funded by emh which secured the £9 million of funding needed for construction. The houses are owned by the Housing Association and managed by the partnership and profits help run the many community activities ran by the NC. The new homes have been built to the highest Passivhaus standards, diminishing energy bills for the future occupants. 7 of the dwellings are also wheelchair accessible.
Opportunities to be explored in Graiseley	Although a long and costly enterprise, housing construction is one of the most tangible actions which a community can undertake to take control of the type and price of the housing in its area. If managed well, it also creates a physical asset which will bring perennial returns to a community trust fund. In particular, the high energy standards of these homes could help tackle fuel poverty in Graiseley.

Table 14: Financial Instruments Case Study – Revolving Fund

Financial Instrument	Revolving Fund
Case Study	Hampshire County Council Revolving Fund
Mechanism	A revolving fund is set up by the Local Authority which enables any individual community project to apply for funding. Any returns on investment will be reinvested into the fund to allow for new projects to be financed and making the fund sustainable stream of income for investment into energy projects.
Where it has been applied before / how it worked	A partnership between Hampshire County Council and Community Energy South was set up provide supports for community in Hampshire to benefit from locally owned renewable energy. Hampshire County Council allocated £250,000 to the Revolving Community Energy Fund (RCEF) in May 2022. Each individual project can benefit from a £25,000 kick-start investment from the fund. Once the scheme is operational, the community group can issue a share offer and secure investment against the operational asset and pay back the £25,000 and returns into the RCEF. This ensures that the fund is not depleted and can sustainably finance new energy projects.
Opportunities to be explored in Graiseley	The fund allows for a sustained stream of investment which does not rely on governmental grants. This could be an interesting funding mechanism for Graiseley given the high number of low EPC properties.

Besides the exploration of new investment tools, the activities for the first phase of the demonstrator should also include:

- Studying the applicability of announced new waves of subsidies. This is the case, for instance, of the Energy Company Obligation (ECO4) flex scheme, to be launched in July 2022.
- Exploring the option of using compliance carbon offsetting from new development schemes in Wolverhampton (i.e. through s106 funds) to fund projects in the demonstrator area.
- Utilising our strategic '3 Cities' partnership with Coventry and Birmingham to explore private investment opportunities within the social housing sector.

7. Project Delivery Plan

Summary of key findings and conclusions

- The project delivery plan is designed to complement and enhance benefits realisation for the community, whilst also achieving the aims set out in WMCA's NZN Strategy.
- WMCA's £1.65m will fund both capital and operational activities with an 80/20% distribution. Capital projects will be delivered across housing, transport, public realm and green infrastructure. Operational spend includes community engagement/education, programme management and research/initiative development. CWC will contribute additional funds through existing and new funding streams to build the effectiveness of the NZN programme.
- CWC will start with a dedicated service-led governance structure and Net Zero Programme Board, moving towards a place-based programme team.
- A phased delivery model will be utilised, with final scope being co-created with the community.
- Existing contracts will be utilised to deliver quickly and efficiently. These contracts will be built on through the phases to realise increased social, financial, and community benefits.
- Stakeholder management and quality assurance activities will both be core components of the delivery model and governance structure with two dedicated stakeholder groups feeding directly into the Net Zero Programme Board.
- KPIs have been proposed, aligned with the objectives of the Net Zero Programme, across economic, social, environmental, programme and benefits realisation categories.
- Intervention delivery and project close out have been planned for to ensure benefits are continued to be seen in the long-term, setting us on a pathway to Net Zero by 2041.

What sets this approach up for success?

A combination of our bold vision, a dedicated team and a co-produced delivery approach with our stakeholders means we will create an impact both inside and outside of Graiseley. Our collaborative methods are designed to create excitement and a combined level of commitment with our residents to achieve a Net Zero Neighbourhood. The features of this plan to achieve this goal are:

- Creation of a dedicated place-based team, who share a goal to achieve a bold, innovative and sustainable long-term solution.
- Logical and careful approach to choosing the street level demonstrator, based on proven assessment criteria; creating a standardised approach to use for future phases.
- Phased approach to create buy-in from residents and other stakeholders. Utilising this phased approach means we can listen to our stakeholders and co-create the scope and delivery methods so that everyone is bought into the approach from the start. This buy-in will create commitment with our community; a soft-contract and will mean they are more willing to invest their time, energy and money to achieving a combined goal.
- Creation of a 'Net Zero Hive' of activity and information in the community hub. This hub will garner enthusiasm by connecting people, creating community-led initiatives, house physical product examples and architectural renders of what the future will look like. The community will be able to ask questions, seek answers and be involved in decision-making on a regular basis.
- Ensuring new contracts have a built-in enterprise commitment to help up-skill the local residents and start developing a more sustainable future.
- Creation of a true demonstrator, investing in a wide range of solutions that will not only reduce carbon, but also test innovations and new initiatives. These initiatives will prove the value to the community and provide confidence for the Council in scaling up to the wider neighbourhood.
- Creating strong partnerships to drive innovation, such as Energy Systems Catapult, Innovation Accelerator programmes, Marches Energy Agency and University Wolverhampton.
- Exploration of new technologies and innovative practises.

7.1 Aims

The delivery model is designed to complement and enhance benefits realisation for the community, whilst also achieving the aims set out in West Midlands Combined Authority's Net Zero Neighbourhoods Strategy.

The guiding delivery aims, and principles are as follows:

- Delivery model maximises value from the £1.65m and additional available funding
- Delivery model will start modest and grow, in terms of team size, processes and tools, to reflect increased scope, funding and potential for benefits realisation
- Each phase of work will deliver benefits in isolation, as well as enabling future larger scale benefits realisation
- Street-level demonstrator interventions act as a demonstrator for application across the wider neighbourhood
- Community engagement is central to all activities and interventions

The following sections describe how these guiding principles will be met by CWC in the approach to activities, governance, processes, and tools.

7.2 Phase 1 Scope

Detailed scope items and costs can be found in section 6, a summary is shown below which totals the complete investment for phase 1 of the programme.

Table 15: Summary of funding allocation by project portfolio, Phase 1

Project Portfolio			WMCA Funding (£)	CWC Contribution (£)	External funding (£)	Total Cost (£)
Capital	80%	Residential – Deep retrofit	500,200	-	111,000[d]	**611,500**
		Residential – Partial retrofit	684,000	-	-	**684,000**
		Transport and public realm uplifts	32,600	37,500[a]	10,000[e]	**80,125**
		Green infrastructure	107,200	15,850[b]	-	**123,030**
Operational	20%	Community engagement & education	162,000	82,500 [c]	-	**165,000**
		Programme management and oversight	82,000	82,500 [c]	-	**82,500**
		Research (scaling up, etc.)	82,000	-	-	**82,500**
		TOTAL	**1,650,000**	**218,350**	**121,000**	**1,989,350**

a) Estimate assumed to be part of the ongoing delivery of LED street-lighting, b) extension of the Tiny Forest initiative, c) Match funding by CWC likely through in-kind time commitment, d) LAD3 funding, e) Estimate assumed to be part of the On Street Residential Charging Scheme

Below is a high-level plan on a page for phase 1. A detailed schedule for the Programme can be found in Appendix A.6.

Figure 37: Net Zero Neighbourhoods plan on a page

7.3 Project Partners and Governance

CWC are committed to achieving the NZN strategy objectives for Graiseley and recognise the need to devote a dedicated, influential, and appropriately skilled team. Our proposed approach balances three aspects; ***1)*** *quick delivery,* ***2)*** *existing knowledge within the Council and* ***3)*** *a strategic and ambitious programme-level capability.*

To successfully achieve the desired programme outcomes quickly, we will utilise and grow relationships with existing delivery partners, governance channels and community groups where possible. It is expected for these to develop as the programme grows in value and where necessary, new delivery channels will be introduced to support the programme.

In addition to existing contracts, a Stakeholder Advisory Panel will be formed to provide an eco-system of Delivery Partners to draw on expertise and test interventions and strategies. Marches Energy Agency will be a key ally in the successful delivery of the NZN programme and will support CWC in developing an effective customer journey approach for Graiseley.

The intention is to start as a service-led programme within CWC's organisational structure and move towards a strategic place-based programme utilising the governance and plans set out in this section to create a dedicated delivery vehicle.

7.3.1 Roles & responsibilities

The below role descriptions describe the activities and responsibilities of the role holder. During the early stages of this programme, CWC recognise the need for matrix working to fill the outlined roles, due to the service-led set-up within the Council. Therefore, initially it is not expected that these roles are all filled by separate people, but rather the responsibilities fulfilled by a blended team. However, as the value of the programme increases, so will the move towards a place-based approach and the growth of this programme team to allow for additional personnel to fulfil each role. It is anticipated that external resource will be utilised to achieve this aim.

These roles set out the responsibilities needed to deliver the programme scope, manage interfaces, engage with stakeholders and maximise the value from the funding available.

Programme Sponsor will be identified in CWC who will be responsible for overall delivery of the NZN Programme, liaising with the wider Council to gain buy-in, approvals and harness learnings. The appointed person will be John Roseblade – Director for City Housing and Environment.

Programme Manager will work alongside the Programme Director to manage the delivery of the NZN Programme, guiding the programme, delivery, and stakeholder team to achieving successful programme outcomes. This role is likely to be filled as the programme grows and will deputise for the Programme Director.

Finance Manager to identify and manage additional funding streams and outgoing. They will also maintain a cost plan across the programme and work with the Procurement Manager on the development of social enterprises.

Procurement Manager to manage the pipeline of procurement activities of goods and services; both utilising existing contracts and developing tender packs for any additional supply chain requirements. They will also be responsible for managing supply chain relationships and contributing to the development of social enterprises.

Programme & Project Management team will be responsible for the creation and maintenance of project schedules, resource management, risk management, assurance activities, health and safety, information management and reporting within the programme team, within the CWC, WMCA and to the supply chain.

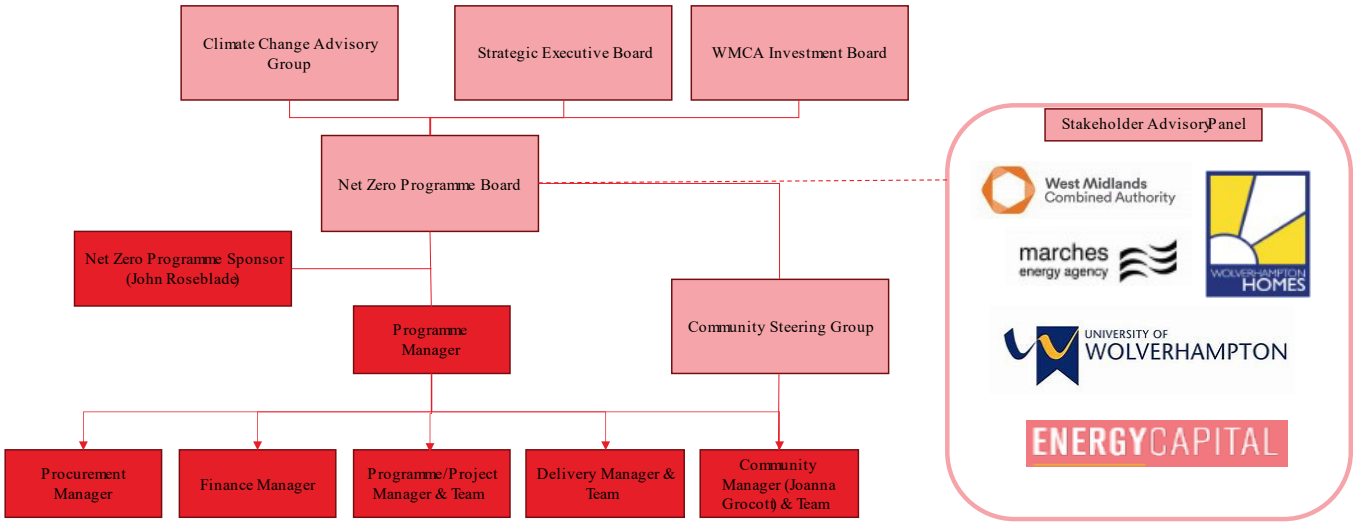
Delivery Team will be responsible for managing the capital interventions and initiatives, aligning on site activities with project & programme objectives, schedule adherence and risk management. It is envisaged that for the first phase of works, responsibility for this will be split by intervention within the services of CWC. Supporting roles to form part of the delivery team will include:

- Active travel - Tim Philpot (Sustainable Travel Lead)
- EV infrastructure - Kester Sleeman (Black Country ULEV programme manager)
- Housing Decarbonisation - TBC (Climate Change Manager housing)

Community Manager & Team will be responsible for stakeholder and community engagement, including community-based initiatives and design/delivery of community campaigns. Joanna Grocott will be the Community Lead.

The below delivery framework represents these roles in team form, with management and escalation lines. The lighter shaded boxes show key stakeholders and advisors to the NZN Programme, however they will not formally be part of the team, except where they are required in the delivery team function.

Figure 38: Proposed Net Zero Neighbourhoods Delivery Framework



7.3.2 Governance Structure

A NZN Programme Board will be established to lead the programme. The main function of the Board will be to discuss strategic decisions, mitigate risks, agree funding allocations and ensure the programme continues to meet the desired objectives.

A key to success for the NZN Programme is to ensure CWC are working collaboratively to cohesively deliver the Programme's objectives. The NZN Programme Board will comprise of all key stakeholder groups and act as a vehicle to update and engage with those stakeholders.

The NZN Programme Board will be chaired by the Programme Sponsor, John Roseblade, and will have Directors, or representatives, from across all relevant directorates, including City Environment, Strategy, Regeneration, Assets, Public Health Communications, Transport, Housing, Fuel Poverty Wolverhampton Homes and Public Realm.

Where decisions or updates are of a strategic nature, these will be escalated to the Strategic Exec Board and to the WMCA Investment Board. Other financial and procurement panels, such as Cabinet Resources Panel, will be utilised as appropriate. Significant scope and items affecting KPIs will be taken to Cabinet.

The existing Climate Change Advisory Group will expand its membership to include Ward Members and relevant portfolio leads to guide and support the NZN Programme within the context of the wider Wolverhampton climate change and sustainability programmes of work.

A Community Steering Group will be created to draw community-based decision-making directly into the Programme Board. This Group provides a clear pathway for engagement with communities by our delivery teams and Partners, with both issues and opportunities being escalated to the Programme Board. Initially this will be led by local councillors and community liaison officer, however we would look to put Community Leaders in place to drive this group so the residents feel empowered and can see how influential their views are in the programme.

A Stakeholder Advisory Panel will be formed with our Delivery Partners who will become our ecosystem of advisors on customer journey, innovative technical solutions, community best practise and delivery principles. The Programme Board will utilise this Panel to co-develop the programme against these best practise principles.

7.3.3 Stakeholder Engagement

The NZN Programme is a strategic and priority programme for CWC, touching on almost every service within council operations. It is therefore imperative that the programme governance reflects the cross-cutting nature and allows for sufficient council stakeholder engagement.

The community steering group and stakeholder advisory panel are fundamental to the success of the programme and will be utilised to co-develop the programme. Utilising stakeholder mapping at the start of the programme, we will be able to provide tailored approaches depending on the interest and influence of each stakeholder. As can be seen in Figure 38, both the Community Steering Group and Stakeholder Advisory Panel feed directly into the NZN Programme Board as a key part of the governance structure. Where decisions are taken at the Programme Board, key stakeholders from these groups will be invited to comment, share and be part of the decision-making process. More detail can be found in Section 8.

The NZN Programme Board provides an important formal stakeholder engagement route, however day-to-day engagement will be open and ongoing to ensure all stakeholders views are factored into the methods and scope of delivery. To aid the commitment to open engagement, a 'Net Zero Hub' will be formed in the community hub to connect people. It will house physical product examples and architectural renders of what the future could look like, as well as being a location for the community to ask questions, seek answers and be involved in decision-making.

WMCA's NZN Delivery Manager will be a key stakeholder to ensure outcomes are aligned with the overall strategy. Regular and collaborative reviews will be undertaken to share learnings across the authority, explore funding mechanisms and adapt scope to meet strategic outcomes. The NZN Delivery Manager will receive all programme updates through regular reporting and be invited to the NZN Programme Board where appropriate to seek further updates.

7.4 Planning

This section details how CWC plan to deliver the works associated with the NZN Programme. These items will be finalised through the mobilisation phase, such that a full suite of delivery and management plans can be signed off at the first NZN Programme Board meeting.

7.4.1 Delivery model

CWC will take a phased approach to deliver the NZN Programme. As stated in the programme aims, each phase will realise and maximise benefits in isolation, whilst in parallel enabling future phases to scale-up and enhance the benefits across the wider neighbourhood.

To achieve this, each phase will have four complementary elements running in parallel

- Capital investment in building retrofit, energy, transport, green infrastructure etc.
- Research activities including initiatives for funding vehicles, scaling-up interventions, training, community buy-in etc.
- Community engagement activities
- Programme management and planning

Table 16: NZN Programme Phasing Approach

Phase 1	Phase 1 delivers scope detailed in section 6.2 within the street-level demonstrator. This includes interventions across buildings (deep retrofit and 'at-scale'), energy/heating, transport and environment. It also covers community engagement, detailed in section 8, and programme/project management activities to both support the phase 1 interventions and test initiatives for implementation at future phases. This phase is expected to last 1-2 years, currently programmed to finish in March 2024. This phase will utilise the £1.65m funding plus additionally sourced funding where applicable. In acting as a demonstrator, phase 1 will provide an opportunity to test, monitor and iterate various initiatives to ensure they are ready for scale-up in phases two and three. This test, monitor and iterate approach applies particularly to retrofit in privately owned homes, energy utilisation, overarching community engagement, and social enterprise initiation.
Phase 2	Phase 2 will continue deep retrofit and deliver initiatives explored during phase 1 in all sectors across the pilot street. Neighbourhood initiatives explored in this phase will also be delivered – scope to be finalised during phase 1. At the end of this phase the street-level demonstrator will be complete and become a net zero demonstrator, that can be replicated across Graiseley. We will have also delivered and trialled and monitored effectiveness of some neighbourhood initiatives. This phase is expected to last 2-3 years, currently programmed to finish May 2026. It will utilise funding secured as part of the planning phase.
Phase 3	Phase three will deliver neighbourhood opportunities, looking to move towards a net-zero neighbourhood. It is expected to last 5+ years.

Whilst the delivery of phases 2 and 3 will follow phase 1, the planning of phases 2 and 3 will start in phase 1 to ensure necessary contracts, funding, personnel and plans are in place in time for delivery. More detail can be seen in section 7.4.

This phased approach allows for review points with key stakeholders to learn from each phase and shape future phases to better realise the overarching benefits and complement WMCA's NZN Strategy.

Phase 1 will predominantly be delivered through existing council services and contracts to enable quick and efficient delivery, with phases 2 and 3 looking to build additional supply chain vehicles to deliver desired neighbourhood outcomes.

7.4.2 Procurement

Phase 1 will take advantage of and build on existing contracts, such as the contract that will be in place to deliver LAD3/HUG1, low carbon heat and energy generation, ORCS for EV charging, Midlands Highways Alliance Framework for public realm works, WMCA bikeshare contract and Marches Energy Agency. Conversations with existing supply chain contracts will be held to inform them of this programme. These conversations and negotiations will look to maximise opportunity for reductions in price; based on the prospect of securing future work through the programme's subsequent phases.

Current available contracts are shown below. This table also highlights an immediate gap which will require dedicated procurement in phase 1.

Table 17: Current available contracts for the NZN Programme

Contract	Relevance	Status	Term (years)
Black Country EVCP contract	Expansion of public charging network	Final stages of procurement	10 + 3 + 2
Black Country Framework	Highways Civils and Public Realm	In place	4
Midlands Highway Alliance	Highways Civils and Public Realm	In Place	4 + 2 + 2
Housing retrofit contract	Domestic retrofit and renewable energy	Planned	1 + 1 + 1 (Option to extend to 4 years)
WMCA cycle hire Contract	Cycle hire expansion	In place	TBC
Marches energy agency	Energy efficiency Customer journey support (Nottingham City Council)	In Place	Procured to support delivery of green homes grant and sustainable warmth competition funding
Gaps			
	Renewable/community energy heating and storage	Proposed	TBC

To achieve efficiencies of scale, phases 2 and 3 will look to expand the supply chain with targeted procurement activities with potential regeneration partners. It is expected that this will comprise a turn-key contract to build trusted relationships and achieve the wider relationship-based outcomes, including community and social benefits.

A Contract Management Plan will be created to detail these choices, risks and mitigations, together with Wolverhampton City Councillors during Phase 1.

7.4.3 Schedule

The schedule will be developed and maintained by the programme management team, with significant input from the delivery and community team.

Supply chain delivery contractors will input into this programme and requirements will be written into their contract.

Critical path and integration activities will be carried out by the programme management team, whilst also maintaining a project on a page type summary to act as simple aid for communication to stakeholders.

7.4.4 Resourcing

There is a recognition that utilising both internal and external resource will be necessary to deliver this programme. Internal specialist resource who are already delivering similar works will be utilised to lead and contribute to the roles described. This will be essential for continuity, understanding of working practises and importantly, knowledge of the community. CWC are committed to match fund the OPEX allocated finds (see section 6.3.1.2) with internal resource commitment.

As the place-based approach develops, the externally sourced resources to fill roles within the programme, delivery and community teams will be introduced to supplement the council teams and provide the dedicated vehicle to drive delivery to programme. This recruitment and/or contracted services will run alongside delivery such that phase 1 delivery is not hindered by these additional activities.

7.4.5 Risks & Risk Management

Initial risks have been identified in Appendix A.5.

Programme risks, issues, assumptions and opportunities shall be managed by the programme team, with input from all programme teams and stakeholders.

Financial risks and opportunities will be managed by the finance lead, with an escalation route to the programme risk register as appropriate.

Risks and opportunities will be focused on achieving desired outcomes and therefore realising programme benefits. To ensure benefits are maximised, the risk mitigations will inform and shape the scope and delivery mechanisms used on an ongoing basis. Decisions will be always made with these risks and opportunities in mind.

Risk management is a day-to-day activity; however, the registers will be reviewed on a monthly basis, with top risks and risk owners updated on a quarterly basis or more often as changes arise.

7.4.6 Cost Plan

Our Finance Manager will create and maintain a detailed cost plan, including:

- Sources of funding and expected timescales for receipt
- Currently available funds
- Forecast costs (capital expenditure and resource/consultant costs)
- Actual costs (capital expenditure and resource/consultant costs)
- Contingency appropriate for stage of delivery, including timescales for release of contingency

7.4.7 Assurance and Monitoring Success

Assurance

All delivery contractors will be required to comply with the appropriate national and local regulations, including PAS 2035, details of which will be included in the delivery contracts. A clerk of works will be appointed by CWC to monitor quality and compliance with those regulations.

Monitoring Success

The scope of each project will be aligned with one or more programme objectives and will be detailed in a benefits realisation plan at the beginning of each phase. Once a phase is complete, it will be possible to measure success quantitatively and qualitatively in terms of: £ value, carbon savings and overarching energy needs, looking towards achieving a net zero neighbourhood.

During construction and mid-intervention, programme level benefits monitoring will be possible utilising the benefits realisation plan and associated KPIs. Each project and initiative will be linked to one or more programme objectives and as these get delivered, to demonstrate which outcomes and benefits start to be realised.

Aligned with the programme vision, critical success factors and benefits realisation plan, a series of KPIs will be created to monitor progress against outcomes. These KPIs will feature on the monthly and quarterly

reports detailed in section 7.4.10. Proposed interim and final KPIs are shown below; final measurement criteria will be agreed with the Programme Board, the community and Cabinet once funding and scope is finalised.

Table 18: Proposed Interim and Final NZN Programme KPIs

KPI Category	KPI description	KPI measure (Phase 1)
Economic	Investment cost	70+% of WMCA fund to be attributable to capital interventions 15+% of WMCA fund to be attributable to broader initiatives towards achieving a Net Zero Neighbourhood
	Change in Market Value	Deep retrofit homes valued higher than previously (minus inflation)
Social	Change in fuel poverty	Reduction within the community
	Satisfaction with retrofit	Survey results from community and homeowners
	Deprivation	Access to jobs and skills
Environmental	Change in Energy Performance Certificate	For 'at-scale' retrofit, EPC to 'C' For 'deep' retrofit, EPC to B
	Modal shift	Increased use of public transport and low carbon transport options
Programme	Delivery on time	Key milestones reached within two weeks
Benefits Realisation	Scalable solutions	Initiatives led to documented solutions across Capital and community-based initiatives, ready for scaling out at future phases: - Supply chain - Community - Technology

These KPIs highlight opportunities to partner with digital providers to measure in home benefits more readily.

It is however expected that scope will adapt as stakeholder views are taken on board and on-site constraints materialise. When this occurs, we will look back to the benefits realisation plan to understand what impact the potential scope changes have on expected outcomes and benefits. We can therefore make informed decisions, together with the NZN Programme Board members on any changes in scope.

Phase 1 is designed to test initiatives and approaches, which we will monitor against our programme objectives and then iterate before scaling up for delivery across the wider neighbourhood.

7.4.8 Health & Safety, including CDM

During phase 1 CWC will utilise an existing delivery partner, in conjunction with the Programme team to deliver, monitor and inform HSE of activities undertaken through the NZN Programme.

In later stages, these requirements are likely to be built into the turnkey solution outlined in section 7.4.2.

7.4.9 Information Management

All programme data will be stored in a new area within CWC's Sharepoint site. Appropriate permissions will be granted to ensure confidentiality is maintained whilst also being able to engage with stakeholder and WMCA. In addition, records will be maintained on Verto 365.

7.4.10 Reporting

Reporting will be carried out within the programme management team. Initially reports will be created on a quarterly basis and then become monthly as we progress through the phase and increased activities are undertaken. These reports will be shared ahead of the NZN Programme Board and with WMCA. Periodically

these will be shared at the Strategic Exec Board and Climate Change Advisory Group for information along with any items for decision.

Reporting will act as a mechanism to keep stakeholders informed, provide opportunity for challenge and ensure the programme continues to deliver against the agreed objectives.

The scope of the reports will remain flexible to reflect the stage of the programme and the needs of the stakeholders, however it is anticipated that these will include:

- Progress narrative
- KPI performance
- Financial status
- Key risks
- Lessons learned and continuous improvement items

7.5 Intervention Delivery

Section 7.3 has detailed how we will plan and manage the Programme, including how we will scale up teams and governance to meet the increased activity level as the programme progresses.

This section sets out what activities will be carried out during each phase. Due to the emerging nature of the programme, more detail will evolve for later phases and what is shown will be confirmed once planning and funding for those phases is finalised. Basis for delivery approach has been assessed against the UK Green Building Council Retrofit Playbook – version 2.1 February 2021.

7.5.1 Planning & Design

For Phase 1, the interventions will take advantage of established products, therefore reducing the need for feasibility design work. Phase 1 planning stage will therefore include activities such as:

- Technical and Quality specifications as required for bespoke products and services
- Agreement on contractor and/or designer outputs, e.g. drawings, requirements, tender documentation if separate build contractor, assumption and risk logs
- Agreement and production of any planning & consents requirements
- Scope of wider initiatives, such as how to successfully engage with and install retrofit measures in privately owned houses/flats, the need for a physical information hub, exploration of funding routes through supply chain, social enterprises, competitions, local skills development, etc.
- Community engagement activities, see section 8

As can be seen in the detailed schedule (Appendix A.6), once the planning stage is complete, scope will be finalised, utilising the NZN Programme Board, WMCA and Strategic Exec Boards for agreement.

For Phase 2 and 3, this stage will also encompass feasibility and optioneering design of more bespoke and innovative technologies and practices. Scope will be agreed within the governance arrangements, subject to funding availability and stakeholder engagement.

7.5.2 Procurement

Procurement activities will be commensurate of each intervention. These may include exploration of:

- Procurement of materials, in particular for homeowners
- Procurement of contractor for supply and fit
- Operation/maintenance contracts for any new assets
- Procurement routes for feasibility design, detailed design and build/construction to be explored and agreed for the various interventions in phase 2 and 3
- Opportunities for sustainable, low carbon procurement practises
- Ensuring low carbon procurement practices, aligned with The Green Book, are baked into contractual and tender arrangements
- Ensuring new contracts have a built-in enterprise commitment to up-skill local residents and start developing a more sustainable future

7.5.3 Implementation

The following activities will be included within the contractors' scope and will be closely aligned with the Programme governance and community engagement activities.

- Detailed Design and survey (intervention dependant), including design validation
- Opportunities for reduced disruption and increased efficiency, e.g. combined surveys across sectors and undertaking all surveys in a short, fixed time period.
- Construction, including quality control, clash & coordination and site clearance
- Feedback into the Programme team, including information/data management, schedule management and reporting/monitoring.
- Health & Safety
- Commissioning & snagging (where necessary)
- Contract Management
- Stakeholder engagement

In addition to contractor scope for capital interventions, CWC will manage the enabling functions and interfaces, including:

- Coordination of necessary permits and consents
- Planning applications, as required
- Set-up and continuation of community trusts to leverage suitable and effective solutions
- Initiatives to overcome risks of implementation
- Community & Stakeholder engagement, endorsement and messaging
- Client-side contract management

7.5.4 Handover

This stage will be more applicable to phases 2 and 3 where more involved products and interventions are envisaged, however for the deep retrofit and infrastructure interventions in Phase 1, methods for the following will be explored:

- Operations & maintenance, where it is not the homeowner
- Defects Liability management
- Insurances/Warranties

7.5.5 Project Closure

To actively review, assess and learn from each project and phase, a project closure stage will be carried out.

These learnings will be fed into the next phase, prior to scope finalisation, and into the wider stakeholder and community network to continue maximising benefits, both within, and outside of the NZN Programme.

This stage will include:

- Final reporting – including summary of outcomes and benefits met, financial information, outstanding issues and lessons learned. This reporting will be made available to Wolverhampton and WMCA strategic boards.
- Information Management and archive of all documents, including subsuming into next phase as appropriate.
- Financial and account close with phase 1 contracts.
- A targeted lessons learned review with all key stakeholders
- Decommissioning of any assets or services. For example, removing or transferring programme information from community hubs.

8. Community Engagement Plan

Summary of key findings and conclusions

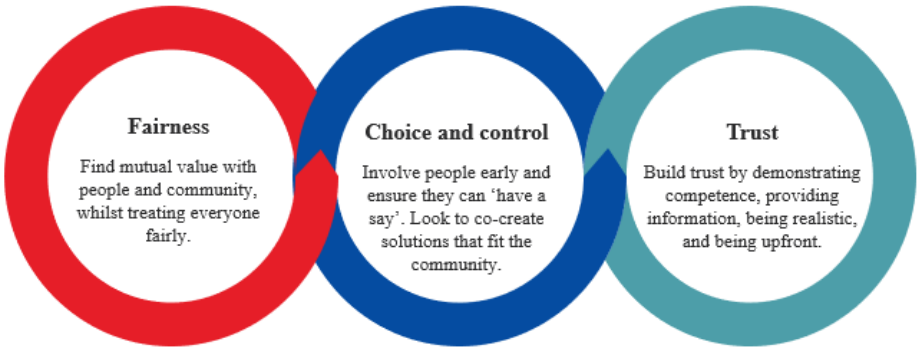
- Involving the community, stakeholders and other partners is a key part of the NZN programme. Clear pathways into the governance of the project will be put in place.
- Further work mapping stakeholders will be undertaken to ensure detail a robust picture is in place of the community, with key people and organisations identified for their contributions.
- The engagement strategy sets key objectives to be delivered – making a commitment to the community, co-creating where possible, partnerships and innovation, new behaviours for net zero, positive customer journeys, delivering social value and creating a narrative with engagement materials.
- The high-level engagement plan lays the building blocks for collaboration on the NZN. In addition to making sure communities and stakeholders are informed, governance structures involving communities and stakeholders are proposed that provide the ecosystem for delivering the outcomes of the programme.

8.1 Delivering collaboration and building capacity in the NZN

Engagement and communication with the communities in Graiseley is a critical part of the delivery of the NZN Demonstrator, with a need to embed net zero philosophies in the community beyond the life of individual projects and the programme. Everyone has a role to play and only by involving the people who live in the area can the programme deliver positive outcomes and the behaviour change required for a truly sustainable neighbourhood.

Core principles on engagement will be at the centre of the project: fairness, choice and control, and trustworthiness (Figure 40). These principles reflect the understanding that people's decision-making processes are a combination of rational, instinctive, and emotional pulls. They will ensure that what is delivered in practice has the community's interest at heart, and this will allow strong relationships to be built with stakeholders and the community.

Figure 39: Key Engagement Principles



8.1.1 Furthering our understanding of the community

Further detailed work is needed to understand and bring the community and stakeholders in to the NZN programme. From the initial research so far (section 4), there is evidence of active community groups in the area with a strong core of people that drive improvements. In addition, there are a number of stakeholders that are or will need to be engaged (Figure 41).

Figure 40: Key Stakeholder Groups

Further stakeholder mapping will need to be undertaken for the NZN Demonstrator and the Phase 1 Pilot Street to make sure a range of people and organisations are involved. The intention is to use existing networks in the community as a starting point, and opportunities will be taken to expand this further. This will allow the creation of a detailed stakeholder matrix, identifying the roles and interests of partners and how they will be engaged – from keeping them informed to co-design of solutions. A key part of this detailed research will be to get a better understanding of behaviours and attitudes to net zero carbon concepts and interventions. This overall approach will allow for the co-creation of the detailed plan, setting clear objectives for success and how to evaluate benefits. Receiving early 'buy-in' from stakeholders will help promote the programme and develop a positive narrative on NZN.

8.1.2 Engagement in the programme governance

Communities and other stakeholders will have clear pathways into the governance of the project to ensure they are engaged from the start, shape the development of outcomes and support the delivery of the NZN Plan in the community.

For the Phase 1 pilot demonstrator, Joanna Grocott as the Community Lead acting as the bridge between the programme community and delivery partners. The role will offer the clear day to day link to the Programme Board where key stakeholders will be invited to comment, share and be part of the decision-making process. A dedicated NZN Community Lead will be considered as the Programme expands beyond Phase 1.

Whilst there are existing community groups in the area, a dedicated NZN steering group should be established (subject to the agreement of the community) as an effective way to include representatives from community groups and the Ward to coordinate development and delivery of the scheme so that they remain engaged directly in the decision-making process and can help establish new behaviours as part of the programme. For Phase 1, the existing community structures in place are expected to feed in to this steering group and support engagement on the Programme. Further details are set out in section 7.2.

The NZN Programme will encourage the public's feedback at every step of the way. This will enable an accurate picture of the experiences, attitudes, and behaviours of a diverse range of stakeholders during the retrofitting process. This understanding will inform what steps need to be taken to enhance benefits and also mitigate concerns and complaints for future interventions. It will also allow the Programme to extend and amplify messaging and secure further buy-in from locals to steer towards behavioural change at a much earlier stage for those not immediately affected by the scheme.

8.2 The engagement strategy

Key objectives have been identified for the engagement strategy to create connections with appropriate community members and stakeholders, ensure that engagement provides meaningful and insightful discussion, and meets the NZN plan objectives.

1) Create a clear commitment with the community and stakeholders

A high-level approach has had to be developed to prepare this NZN Plan, based on current understandings of the area and communities. To turn this plan in to a deliverable framework, a priority action within the first quarter of the programme is to co-create a joint neighbourhood commitment / charter with communities and stakeholders. This commitment will initially focus on works as part of Phase 1 to set clear expectations, actions and plans with those affected to ensure roles are clear, ensure cooperation and to secure buy-in to the approach. All contractors would be required to comply with this commitment. This join neighbourhood commitment would then be adopted for the future stages of this plan.

Local Councillors will have an important role in this key first step on engagement, as well as the relevant Cabinet Members including responsibility for City Environment and Climate Change. The CWC already has a Climate Change Advisory Group chaired by the relevant Cabinet Member, and it is expected that this group will be expanded out to provide political input and oversight on the NZN Programme, with dedicated agenda items and representation from other Cabinet Members and Local Councillors.

2) Deliver meaningful community engagement that co-creates wherever possible

To get messaging across and enact behaviour change throughout the community requires meaningful communications and engagement following the key engagement principles, informed by a clear understanding of the community and stakeholder groups. As part of the engagement approach, a continuous programme of communication will keep communities informed and updated, and drive awareness and change in all areas of life in Graiseley. A detailed communications plan that establishes branding and a consistent set of messages will be prepared.

As well as the overarching plan, each type of intervention will require its own method of engagement, informed by the number of people affects, the impact it has, and the new approaches needed to make it a success. Methods could involve events such as neighbourhood forums, community consultations, and resident meetings, with engagement via traditional methods such as newsletters. There is also the possibility of targeting certain geographies or groups through social, which can strengthen the offer, often with high reach and impressions. Given the high level of deprivation in the area and access to the internet, any activities need to be mindful of providing online as well as in person engagement.

For the Phase 1 pilot, a bespoke plan will be created to test and trial approaches that will benefit the wider programme, including co-designing ways with the community and other stakeholders to secure buy-in for retrofit of homes that are owner occupied, rented and in social housing. Extending and amplifying the messaging to surrounding areas, will encourage greater local buy-in, generating community consensus to elicit behaviour change and laying the foundations for subsequent schemes.

3) Creating strong partnerships to drive innovation

Delivering innovation in the NZN will be a key driver of success in the programme as the city cannot assume that existing approaches will be able achieve net zero without piloting new ideas. With fast paced changes happening in the industry, wider stakeholders have an important role to play, from areas of the supply chain, industry experts and education providers as part of creating a “Living Lab” environment. The CWC already has some positive partnerships arrangements, including:

- WMCA, including their arrangements with the Energy Capital and Innovation Accelerator programmes
- Wolverhampton Homes, who will be investing in their estate in Graiseley and can help drive forward change and innovation
- Marches Energy Agency as energy specialists working in the city delivering Green Homes Grant in part of Graiseley

- University of Wolverhampton who are helping to drive the place-based vision for the National Centre for Sustainable Construction into a delivery model, as well as providing training and education for the skills needed to deliver and test out net zero interventions

There are opportunities to expand these partnerships and develop systems that introduce and scale up data (including smart metres), skills, co-benefits and other benefits during the development, delivery and monitoring of the programme. A lot of training is required, and this could have benefits for local residents. A Stakeholder Advisory Panel board will be established as part of delivering innovation in the programme. This will ensure the programme is building in innovation and practical solutions to delivery of interventions.

Whilst the area is largely a residential area, there is also a role for local businesses both in terms of behaviours and their assets contributing to NZN. This will be picked up in Future Phases of the programme.

4) Embedding net zero behaviours within the community

Achieving net zero will require changes to the way that people and organisations behave if it is to be a success and achieve the outcomes. For example, given the disruptions that the programme could lead to in the short term, there is a need to find better ways to motivate people to have works done their property. In addition, homes that have been through retrofit will need to be lived in differently, for example if its heating has changed to a heat pump. This is part of the legacy of the programme to make sure the net zero behaviours remain after the programme has completed.

Some of the key drivers for residents will be to understand what their options are to reduce their footprint, tailored specifically to their circumstances, whether that is the tenure of their home, it is physical characteristics or their travel needs. Businesses will need to understand the commercial future-proofing opportunity in embracing the climate agenda whilst also being aware of the risks of a changing market and future carbon pricing.

Throughout the communications and engagement plan, behaviour change theories and models will be considered and weaved into the plan and activities, including the EAST Framework of Easy – Attractive – Social and Timely[50]. The aim will be to move towards internalised motivation; doing something as it aligns to who someone is, all the way to intrinsic; undertaking a task because it is inherently rewarding. Applying other theories of behaviour change should have a positive influence on neighbours and the wider Ward.

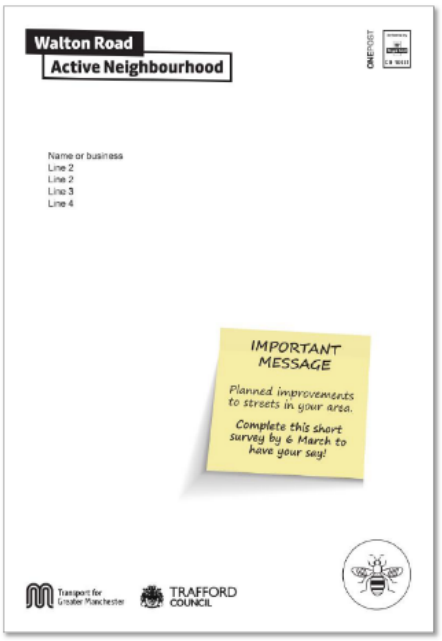
The plan will have the intention of building a positive sentiment towards the practical elements of a NZN. This will include the messages given in any engagement materials where small changes to give residents a clear action and ask can give more positive results and create positive engagement outcomes (see examples in Figure 42). Consideration will be given to how different ideas can play a major part in getting messages across and allowing for a community to be encouraged to take on work or develop the thinking of family, friends, and neighbours. Overall people will retain choice on how they engage with the programme.

[50] https://www.bi.team/publications/east-four-simple-ways-to-apply-behavioural-insights/

Figure 41: Examples of behavioural insights principles being applied to engagement materials

Version A

Version B



Version A

Version B

Thought and opinion leaders in the community (including those references in section 4) will be identified in the engagement plan, particularly those seen as a community anchor and a trusted individual, to help ensure messaging is spread to the community in a timely and appropriate manner. They will facilitate connections to individuals in the community, helping the messages flow throughout the area in a much more effective way to create a mass, rather than messages getting diluted as individuals are isolated. This will help build trust within the community, make information accessible and convenient, and connect benefits and perceived value to shared community values.

5) Creating a positive customer journey as part of the Programme

A key consideration of this plan is how the customer journey for residents is managed for retrofit across different housing tenures (social housing, owner occupier, private rented) and how they will be engaged. The delivery of the programme will lead to disruption for individuals, streets and the neighbourhood, however by creating a clear, concise and informative approach with feedback, the customer journey can be much more positive. There is also a need for coordination with other interventions in the area as it is likely that there will be more than contractor being on site at a time.

Working with the supply chain, including the Marches Energy Agency, can provide their understanding and expectations of customers, particularly where additional measures need to be taken in to account to mitigate issues arising throughout delivery. Having a community hub for the programme should be explored to strengthen the relationship with the community and the supply chain, as well as other programme benefits. It can also help facilitate diary management, promote storage solutions, and answer any frequently asked questions, as well as provide a physical project base. The supply chain are expected to work in partnership with the CWC in delivering this work area under the guidance of the Programme Board.

6) Delivering social value as part of the legacy of the programme

Having a clear plan for delivering social value creates direct links and wider benefits for the NZN as part of its ongoing legacy to improve the quality of life for residents and businesses, particularly given the deprivation currently in Graiseley (see section 4). Social value outcomes are embedded in the outcomes for the Graiseley NZN programme, and are parts of the CWC Our City Our Plan, including reducing deprivation (e.g. improving health and education), getting local people into good jobs, training opportunities in the community and creating a stronger supply chain. A Social Value Plan can help bring the wider community engagement plan and collaboration with residents, businesses, and stakeholders.

The SV plan will take a place-based approach, addressing local needs supporting disadvantaged groups (long term unemployed, unemployed individuals inc. 35 to 44 range), people suffering from or at risk of homelessness, care leavers, ex-offenders, and under-represented group. It will inspire minority communities to consider careers in the sector. The plan will create opportunities to maximise STEM engagement, local recruitment and local spend working with SMEs, social enterprises, local businesses and ensure local labour procurement in Wolverhampton or specified distance from Graiseley (see potential core themes in Figure 43). Through the procurement of delivery partners social value outcomes can be captured and coordinated across the programme to maximise outcomes. The Programme Director and Manager will have responsibility for preparing the plan.

Figure 42: Social Value Plan Potential Core Themes

Graiseley NZN Social Value Plan Core Themes			
Employment	**Skills**	**Outreach and Community Projects**	**Supply Chain**
• Focus on highest unemployment levels (35 – 44) • Local Jobs • Work Experience • Pre-employability programmes	• Focus on disadvantaged / under-performing / under-represented groups • Training/skills development • STEM – promoting the sector and NZN. • Local school partnerships	• Led by needs of community, considering local issues e.g., crime prevention • Partnering with local community and specific groups & SIG	• A stronger supply chain across Wolverhampton to support net zero transition. • Delivery of a NZN Supplier event engaging with MSME's, VCSE's etc • Meet the buyer / procurement, and target local minimum spend.

7) Create a narrative and suite of engagement materials

One of the most important aspects of our engagement materials are key messages on the NZN programme. These will be the consistent narrative to take that will run through the community and stakeholders. When appropriate, providing slide decks and brochures will be used to focus on organisational engagement, in particular funding and delivery partners. Infographics will be created that bring to life a brand identity, as well as a newsletter to local communities in a suitable language. Press releases and articles using public-facing media can build up exposure and target technical media to open connections. Exhibition materials can be produced for virtual or in-person events, allowing for all groups in society to access information and be involved in consultations.

8.3 High-level engagement plan

Figure 43 sets out high level activities that will form part of the NZN communication and engagement plan to meet the programme objectives and provide meaningful community engagement throughout the NZN programme. The approach covers the key stages of customer research, proposition development and delivery.

This schedule of activities will be developed further with communities and stakeholders in the first quarter of the programme to ensure buy-in to the approach. This will include developing our understanding of Graiseley to ensure that target audiences are reached, particularly as each intervention will require different levels of engagement. There will also be a wide-range of communities that need to be considered, especially those that have a high level of deprivation, hard to reach groups and communities with English as a second language. Overall the activities should ensure that people affected by the programme are reliably informed, engaged, and involved.

A flexible and targeted approach will be undertaken to utilise and maximise reach, with a hybrid of digital and traditional methods being undertaken informed by local need. This could entail a mix of online-based consultation as well as in-person events depending on the target audiences.

The schedule in Figure 43 has been prepared on the basis of the Phase 1 pilot, with the expectation that the types of activity will also be relevant for future phases. A key part of the transition in to future phases will be the feedback and lessons learned, to help refine the Community Engagement Plan at that stage. This includes the types of net zero behaviour that has been captured in the Phase 1 area, including the potential for NZN champions to be identified to carry the programme into other areas of Graiseley and the city.

Figure 43: Engagement Activity Schedule

Activity	Actions	Engagement Objectives	Outcomes	Led by
Joint Neighbourhood Commitment / Charter	Creation of a commitment document / Charter between the council, community and stakeholders on the project to establish roles, benefits, outcomes and how all partners will work together.	1, 2, 3, 5	Agreed ways of working with CWC, communities, stakeholders, and contractors Residents feel included Raise awareness of the net zero requirements	Local Councillors and Community Liaison officer
Climate Change Advisory Group	Update the Advisory Group to include the NZN Programme to steer and provide guidance. To be Chaired by the relevant Cabinet Member, with other Cabinet Members to contribute as required. Local Councillors to also be included.	1, 2	Cabinet Members and Local Councillors feel included. Agreed ways of working with Councillors.	Local Councillors
Stakeholder Mapping	Undertake extensive research on stakeholders, including customer research insights their views on NZN, issues / opportunities, influence and interests. This will include community groups, hard to reach groups, people with English as a second language, and thought / opinion leaders in the community. Ensure the range of demographics in the community is considered in the approach.	2, 3, 5	Identification of key stakeholders and role in the programme. Knowledge on how to engage, who with, what on and why. We need to receive early 'buy-in' from stakeholders, to help promote the programme and help develop our positive narrative.	Community Liaison officer
Community Steering Group	Seek nominations for group from community Establish Terms of Reference, including purpose, meeting frequency etc. Expectation that intervention engagement plans will be co-designed with this group as well as affected residents.	1, 2, 3, 5	Residents feel included Clear pathway for engagement with communities by stakeholders and partners	Initially - Local Councillors and Community Liaison officer. Long term – Community Leaders

Activity	Actions	Engagement Objectives	Outcomes	Led by
	Steering group will provide opportunities for community workshops and coordinate regular walkabouts in the area.			
Communication and Engagement Plan	Set out the policy, legislation and guidance to which the engagement approach must align; objectives of engagement; stakeholder identification; and the approach to management and engagement – including the scope and programme of engagement activities, the engagement tools/methods to be used, the level of involvement required from each stakeholder, and how feedback will be captured. The plan will ensure information is: • shared at the right time • Provides confidence and trust • Enables feedback • Uses relevant language, images, and spokespeople that resonate with local audience	All	Clear communication arrangements with the community and stakeholders All partners feel included	Community Lead
Stakeholder Advisory Panel	Identify key representatives for inclusion on the Panel, including Marches Energy Agency Ecosystem of partners to draw on expertise to test interventions / strategies. Expectation that intervention and engagement plans will be shared / co-designed with this group	2, 3, 5, 6	Stakeholders feel included	Community Lead
Landlord Working Group	Regular attendance and meetings with the Landlord Working Group for engagement with the private rented sector. To provide information, education and rationale for delivering this type of intervention.	2, 3, 5, 6	Landlords feel included	Rent with Confidence Officer
Social Value Plan	Creation of the plan with the community, stakeholder and contractors.	3, 4, 6	Social value outcomes captured in the community	Programme Manager
Create and disseminate collateral / engagement materials	Co-create programme narrative with the community and stakeholders, including lines to take in engagement and messaging to different audiences (with consideration of languages). Newsletters for community to be prepared. Council officers will be briefed on the programme. Slide decks and brochures could be used to focus on organisational engagement, in particular funding and delivery partners. To include creation of dedicated webpage, press release / social media, household information packs, infographics, concept art/imagery, FAQ documents etc. Preparation of exhibition materials for virtual or in-person events, allowing for all groups in society to access information and be involved in the consultation. Collateral to be informed by customer research, engagement outputs. Consistent communications will be used across all parties	2, 4, 5, 7,	Communities and stakeholders are informed and engaged	Programme Manager
Community Hub and Net Zero Hive	Creation of a community hub as a way for the programme to have a day-to-day presence in the area. This will include a 'Net Zero Hive' of activity and information in the community hub. This hub will garner enthusiasm by connecting	All	Communities and stakeholders are informed and engaged	Programme Manager / Delivery partners / Contractors

Activity	Actions	Engagement Objectives	Outcomes	Led by
	people, creating community-led initiatives, house physical product examples and architectural renders of what the future will look like. The community will be able to ask questions, seek answers and be involved in decision-making on a regular basis. Information can be shared, and engagement activities led from this hub. Stakeholders and contractors will also have a presence. The hub could go in an existing community building.			
Intervention Engagement Plans	Each type of intervention will have its own engagement plan developed to ensure the specific approach is right for engagement, as well as making sure consistency and coordination across the programme. These will need to set out benefits, as well as approaches to deal with disruption and planned mitigation. This will involve different stakeholders as necessary, e.g. retro fit of homes could involve owners, landlords, and social and private rented tenants.	All	Clear communication arrangements with the community and stakeholders	Delivery partners / Contractors

8.3.1 Monitoring success and providing ongoing feedback

To ensure the continued success of our engagement strategy, a cycle of research, monitoring, and measurement as a routine project activity will be embedded to improve delivery and provide lessons learned for later phases and other areas. This will involve quantitative and qualitative research and monitoring methods, including surveys, complaint feedback, customer service enquiries, and social media sentiment analysis. Monitoring will set out who will be responsible, accountable, consulted, and informed regarding an activity within the engagement schedule. A Stakeholder Log will be created to record stakeholder interactions and will continue to be updated throughout the lifecycle of the project.

At board meetings and formal internal meetings, the 'customer voice' will be a standing agenda item and the latest complaints, praise or other issues raised will be discussed. Insights will help:

- Provide an early indication of upcoming issues, to enable the team to make informed decisions.
- Address root cause of issues.
- Find repeated trends that can be shared across future areas.

Progress on behaviour change and the ability to deliver the programmes outcomes will be developed further, including consideration of:

- Attitudes, preferences, motivation: self-report survey methods
- Proxy behaviours: joining a mailing list, seeking out information
- Focus behaviours: undertaking a community scheme, completing a retrofit activity.

All engagement related risks and opportunities will be included in the project R&O log. This will be utilised during all phases and developed from the first phase. This will provide an effective tool for sharing knowledge which everyone on the team contributes to by adding information and viewing information contributed by others. The register will serve as a basis for meetings on risk management.

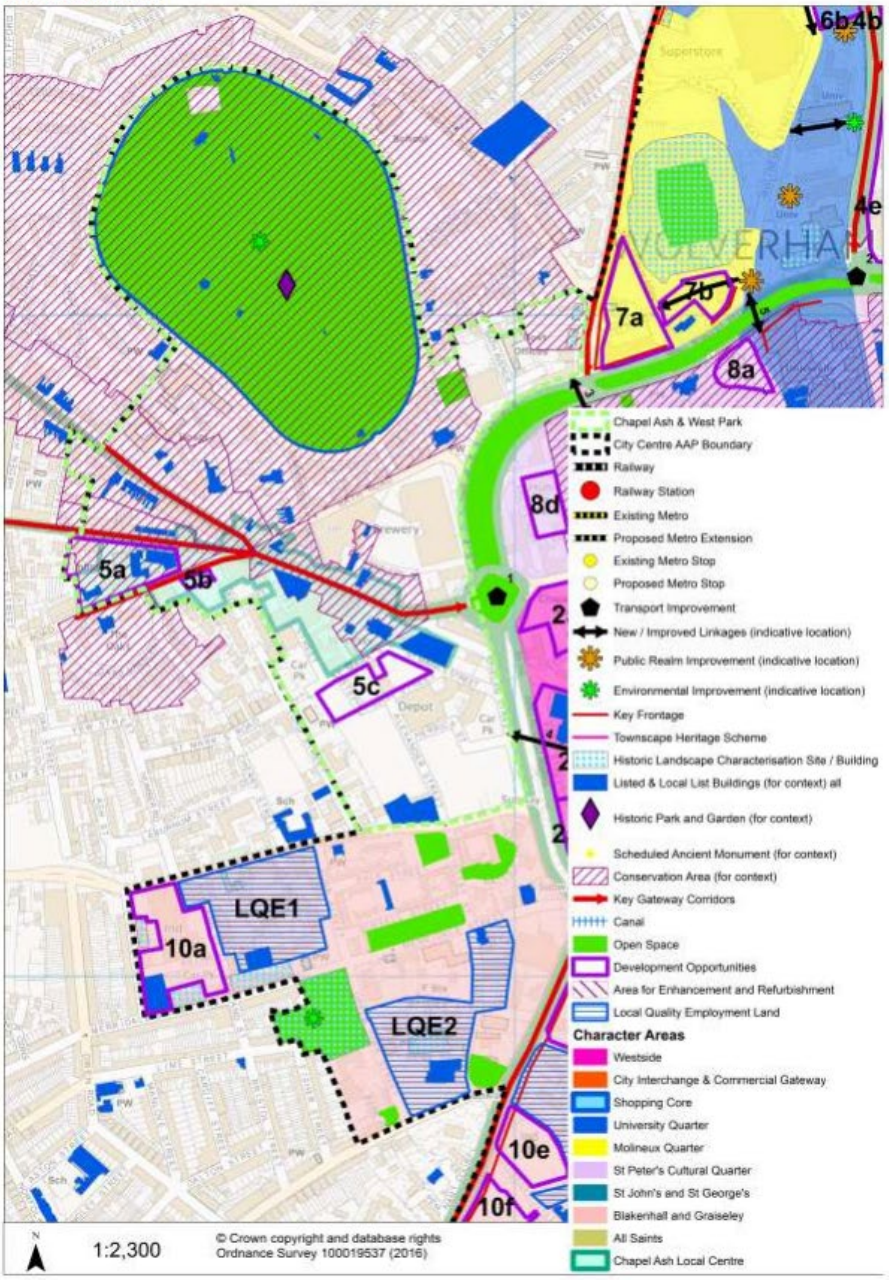
Throughout the community engagement, there is a need to be transparent with feedback received from the community and stakeholders, and how this informs decisions and actions. Feedback will be provided throughout the programme, and this will help create a deeper understanding of stakeholder sentiment, an overview of the key themes arising and lessons learned to share with other NZN. The engagement and programme team will continue to represent the programme via several different channels including attendance at relevant meetings.

A.1 Understanding Local Assets - Supplementary Information

A.1.1 City-wide policies, plans and initiatives

Figure A1.1: Extract from Wolverhampton City Centre Area Action Plan (2016)

Figure 22 Policy CA5 – Detailed Proposals for Chapel Ash & West Park Character Area



A.1.2 Housing stock

Figure A1.2.1: Main heating type of dwellings in Graiseley (Source: Parity Projects 2022)

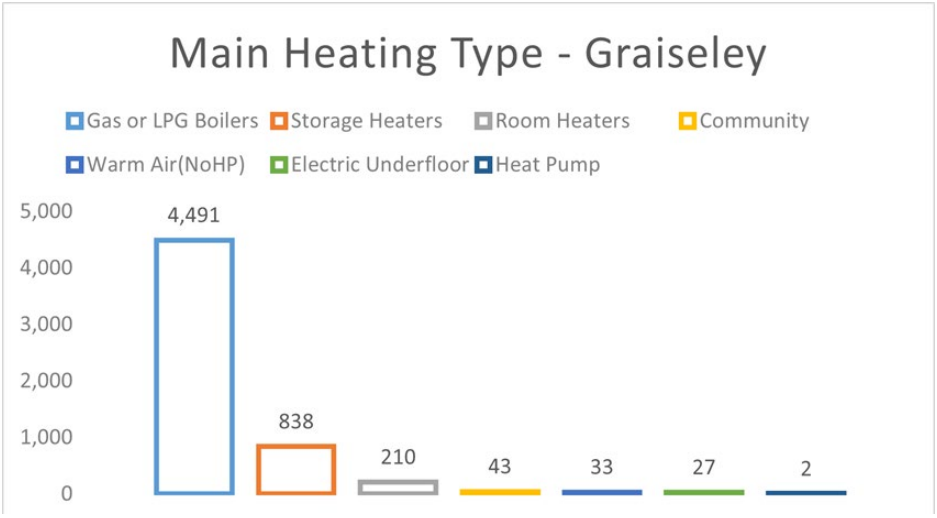
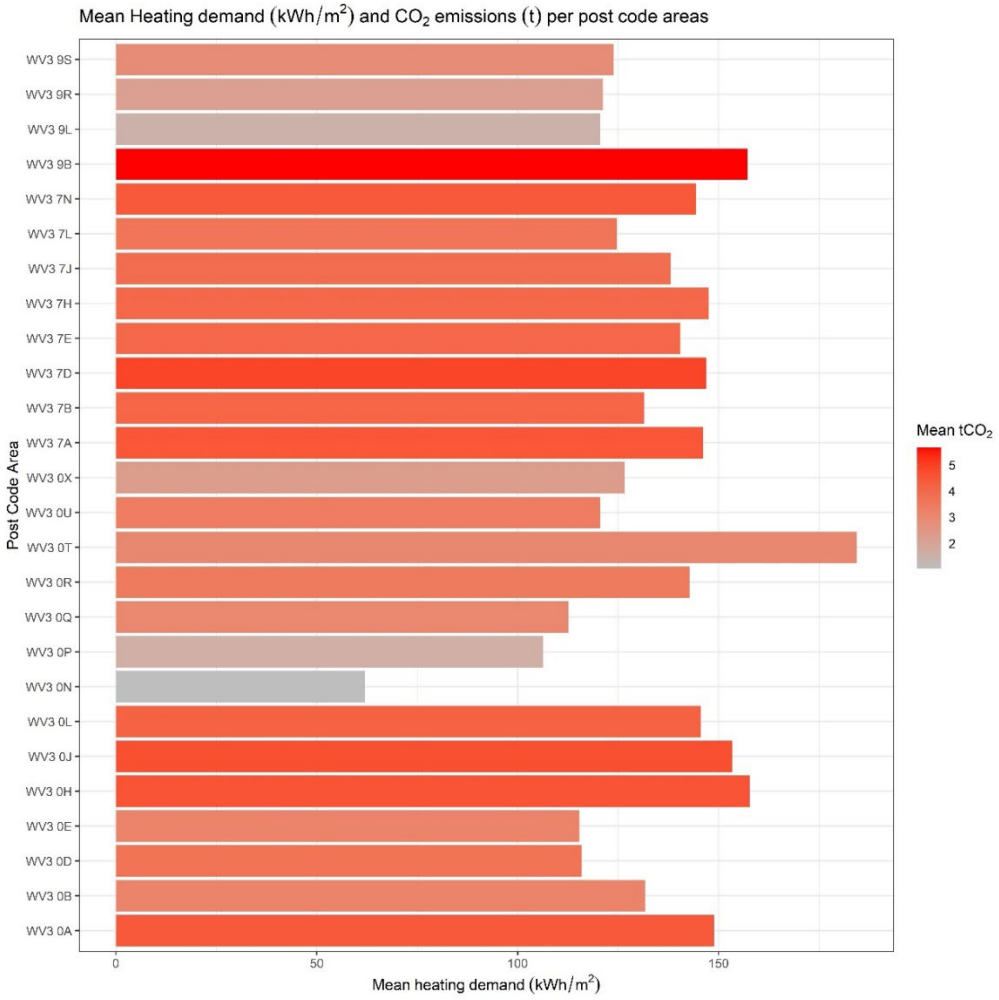


Figure A1.2.2: Mean heating demand (kWh/m^2) and domestic energy related mean tCO$_2$ emissions for post code areas in Graiseley (Source: Parity Projects 2022)



A.1.3 Transport

Figure A1.3.1: Car commuting journeys from WV3 and WV4 postcodes (left) and WV3 and wV1 postcodes (right), (Source: DataShine Commute)

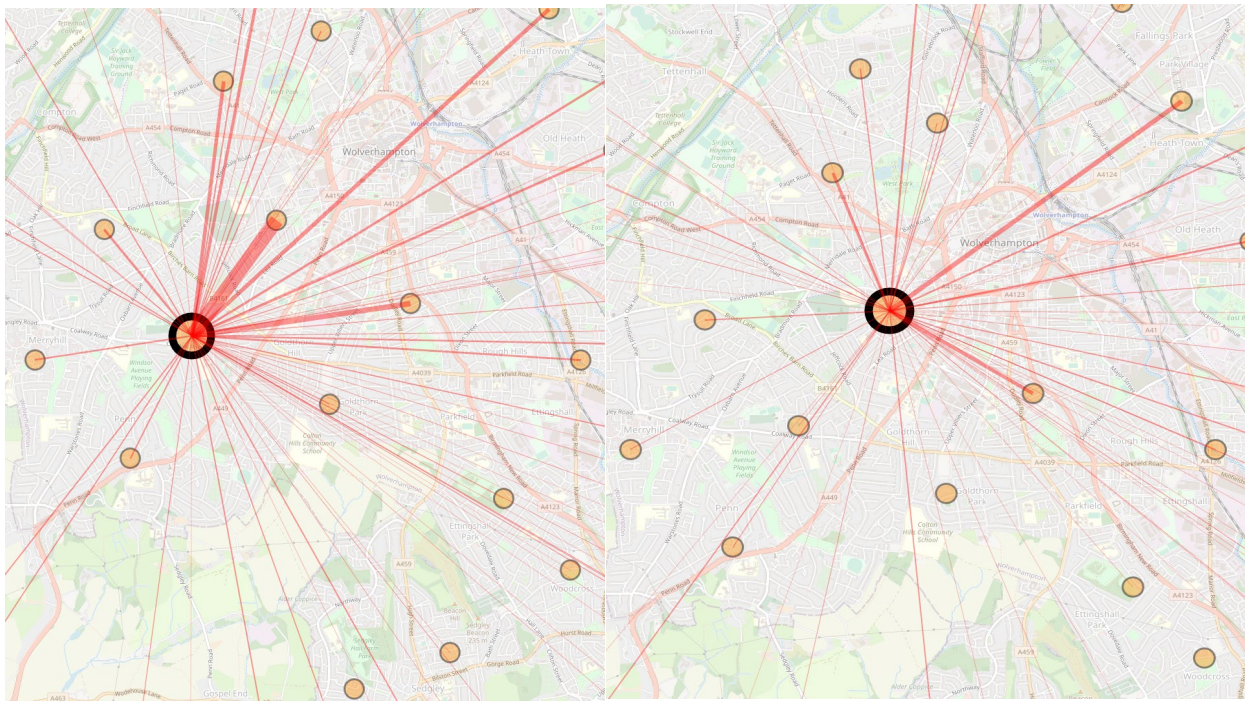


Figure A1.3.2: Public transport routes within Graiseley (Source: TfWM)

Graiseley bus routes provide access to:

- Route 2 – Bushbury – Warstones via Wolverhampton.
- Route 3 – Fordhouses – Castlecroft via Wolverhampton.
- Route 15/15a – Wolverhampton – Merry Hill via Wombourne/Kingswinford.
- Route 63 – Wolverhampton bus station to Merry Hill (Laurel Grove).
- Route 16 – Wolverhampton to Stourbridge via Penn Road, Wombourne, Swindon, Kingswinford & Wordesley.
- Route 64 – The Fold to Wolverhampton Police Station.

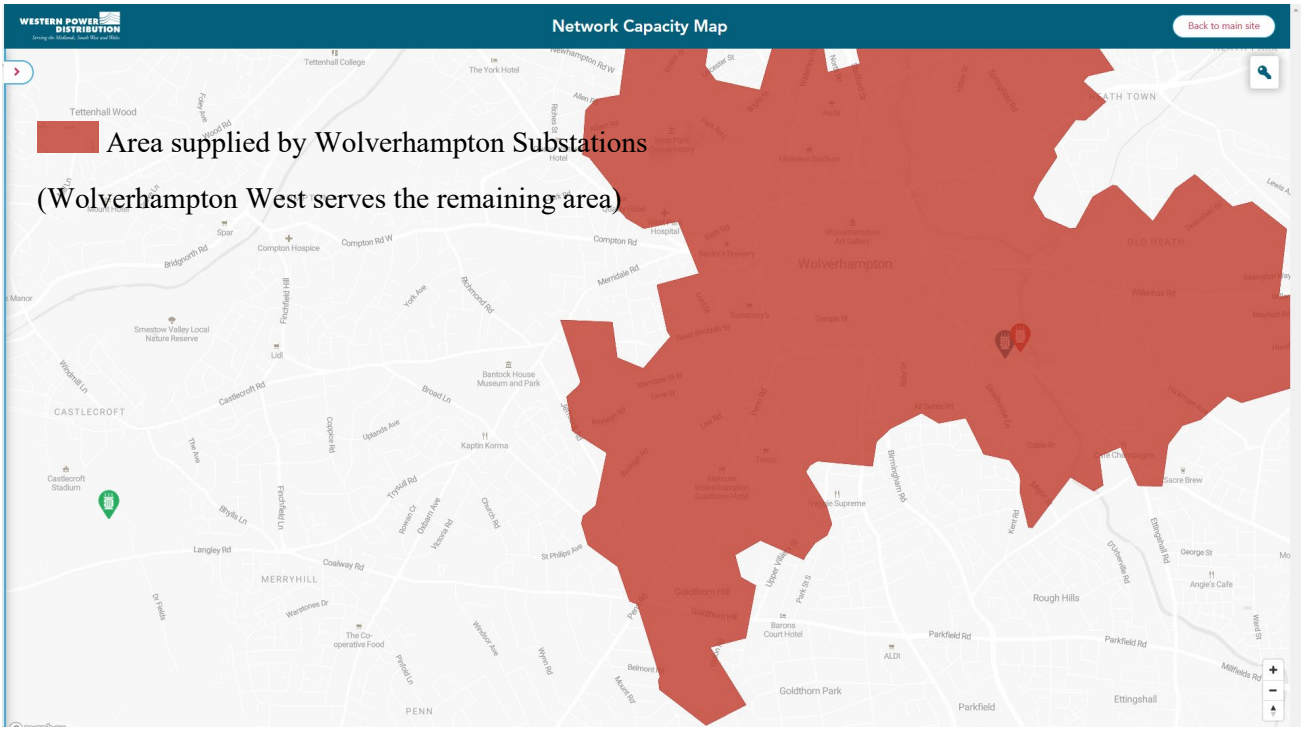
A.1.4 Energy Infrastructure

Figure A1.4.1: Summary of WPD Network Capacity near Graiseley (Source: WPD https://www.westernpower.co.uk/our-network/network-capacity-map-application)

Network Reference ID	Substation Name	Substation Number	Asset Type	Demand Headroom (MVA)	Generation Headroom (MVA)
420034	Wolverhampton 132/33/11kv	670024	Primary	24.58	27.69
314727	Wolverhampton 132/33/11kv	670024	BSP	16.91	-0.51
510239	Wolverhampton Waste Services 33kv	670150	Primary	Not provided	Not provided
314728	Wolverhampton West 132/33kv & 33/11kv	670025	BSP	59.34	68.65
420035	Wolverhampton West 132/33kv & 33/11kv	670025	Primary	14.71	34.22

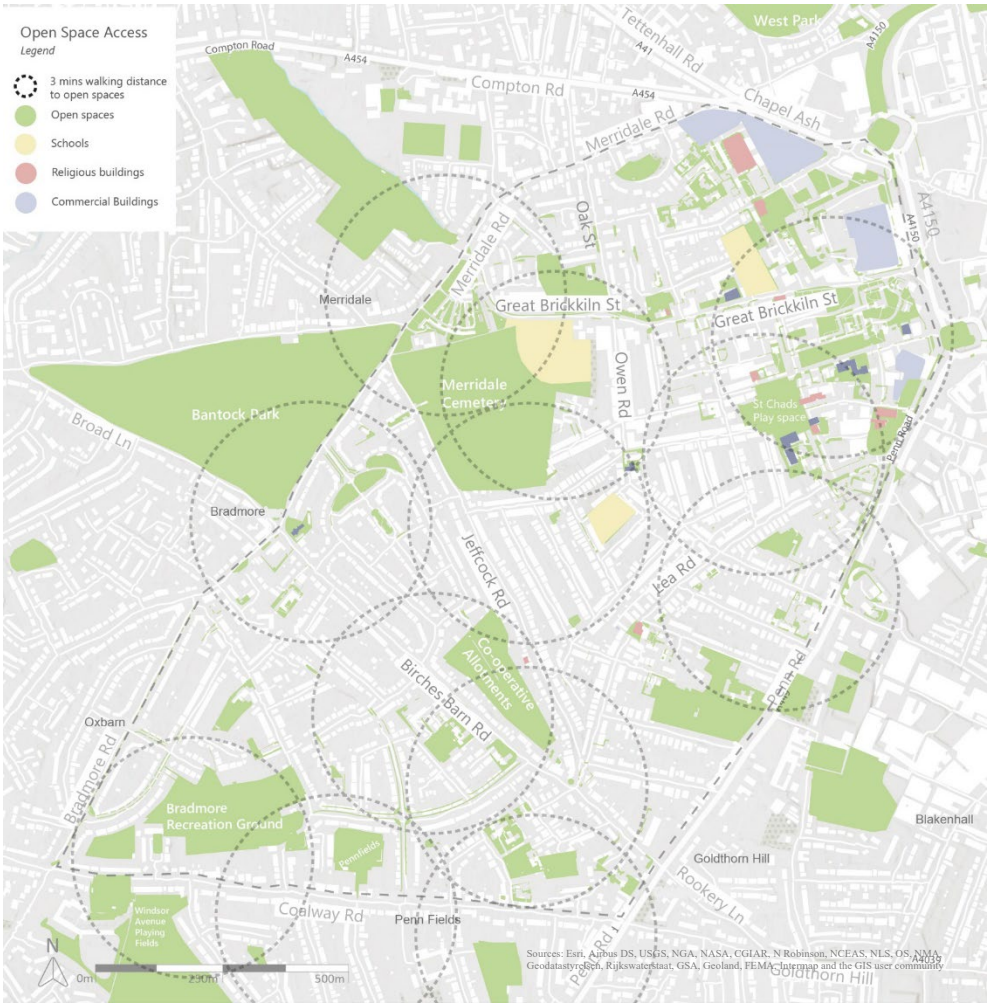
Note – RAG rating taken from WPD website

Figure A1.4.2: WPD Network serving Graiseley (Source https://www.westernpower.co.uk/our-network/network-capacity-map-application)



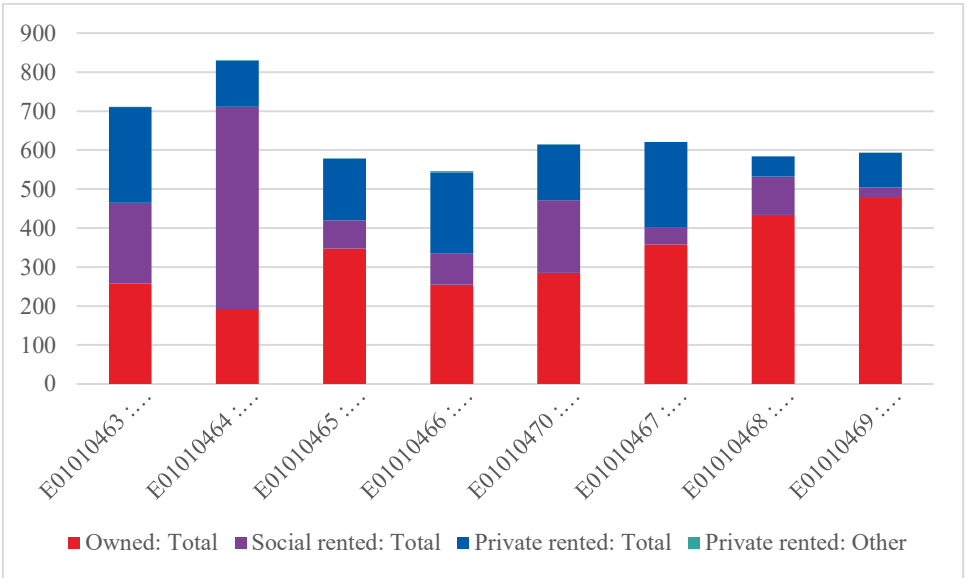
A.1.5 Other local assets and infrastructure

Figure A.1.5.1: Access to Public Open Space in Graiseley (excludes woodland, cemetaries and school grounds)



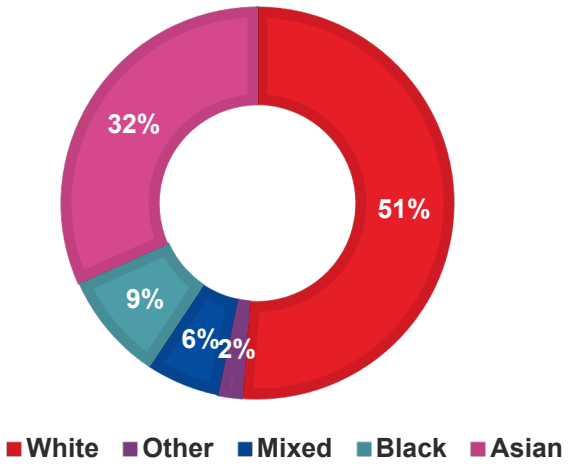
A.1.6 Communities

Figure A1.6.1: Housing Tenure by LSOA (Source: ONS Census 2021)



*E0101063 and 66 cover the Lime Street area

Figure A1.6.2: Ethnicity in Graiseley (Source: Equalities - WVInsight (wolverhampton.gov.uk)



A.1.7 Pilot Street Demonstrator

Table A.1.7: Overview of approaches to identifying the street level demonstrator

Scenario	Advantages	Disadvantages
A	• would show the greatest immediate relief to fuel poor households. • likely to improve household health issues quickly. • would have a clearly measurable and predictable impact on carbon from the outset • can use existing retrofit programme knowledge that has been developed through LAD and HUG programmes	• would not illustrate whole neighbourhood concepts • no additional benefit/difference to other funded household retrofit programmes (e.g. LAD and HUG). • in duplicating the aims of other retrofit programmes, this would not show the additional aims of whole neighbourhood working or scalability • opportunity streets may be limited due to difficulty in getting buy in from private landlords, and tenants who are fearful of eviction due to better standard of property • full home retrofit can be difficult to get householders to agree to due to the level of disruption
B	• likely to be able to illustrate results quickly • build on any existing community buy in to make sure that they see results, and build trust in delivery ability of CWC	• may not show anything new that other programmes are not already showing • could be perceived as an inequitable approach, potentially benefiting a wealthier street who may be able to engage with NZN concepts without additional support.
C	• could illustrate a number of different results that may be replicated on a variety of different streets throughout the neighbourhood • most likely to meet the holistic outcomes set out for Graiseley NZN	• supporting too many initiatives may dilute the impact making it difficult to quantify the benefits created, or if the concept has been proven. • partial retrofits may leave households feeling partly left behind

Taken from a workshop with City of Wolverhampton Council on 26th May 2022.

Figure A1.7.1: Construction age of different house types in the street-level demonstrator area (Parity Projects 2022)

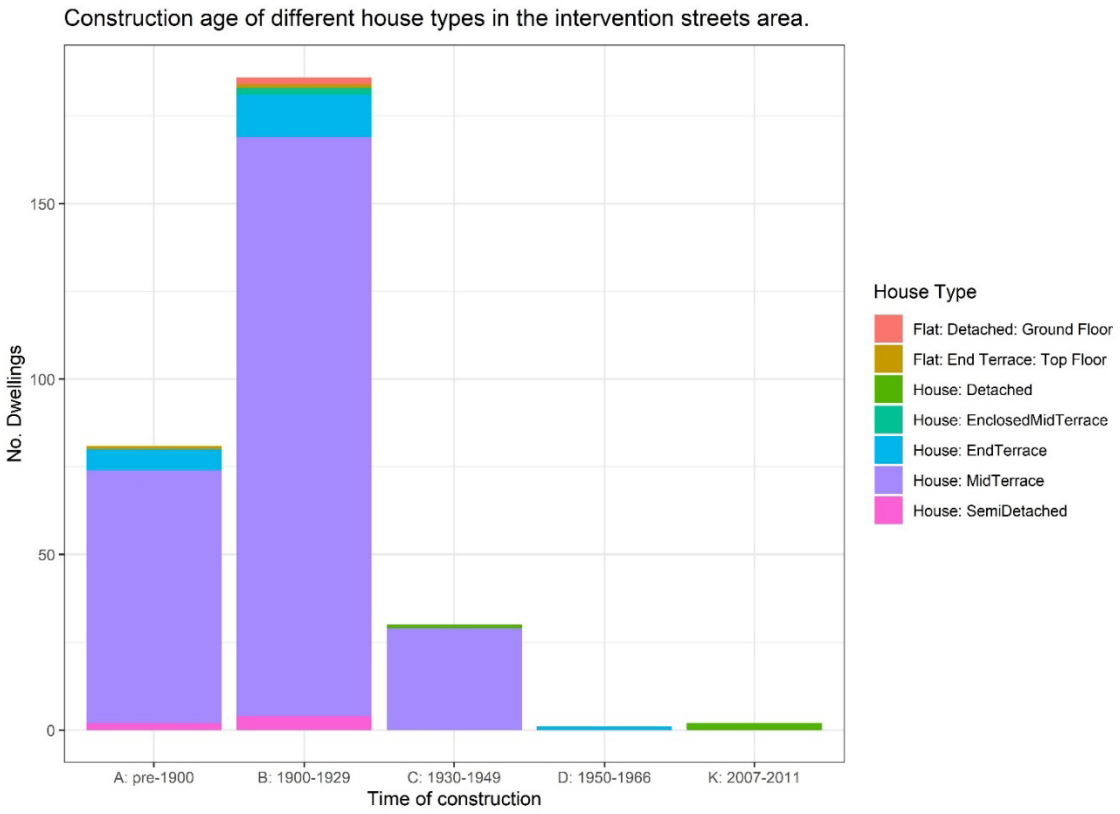


Figure A1.7.2: SAP rating of different house types in the street-level demonstrator area (Source: Parity Projects 2022)

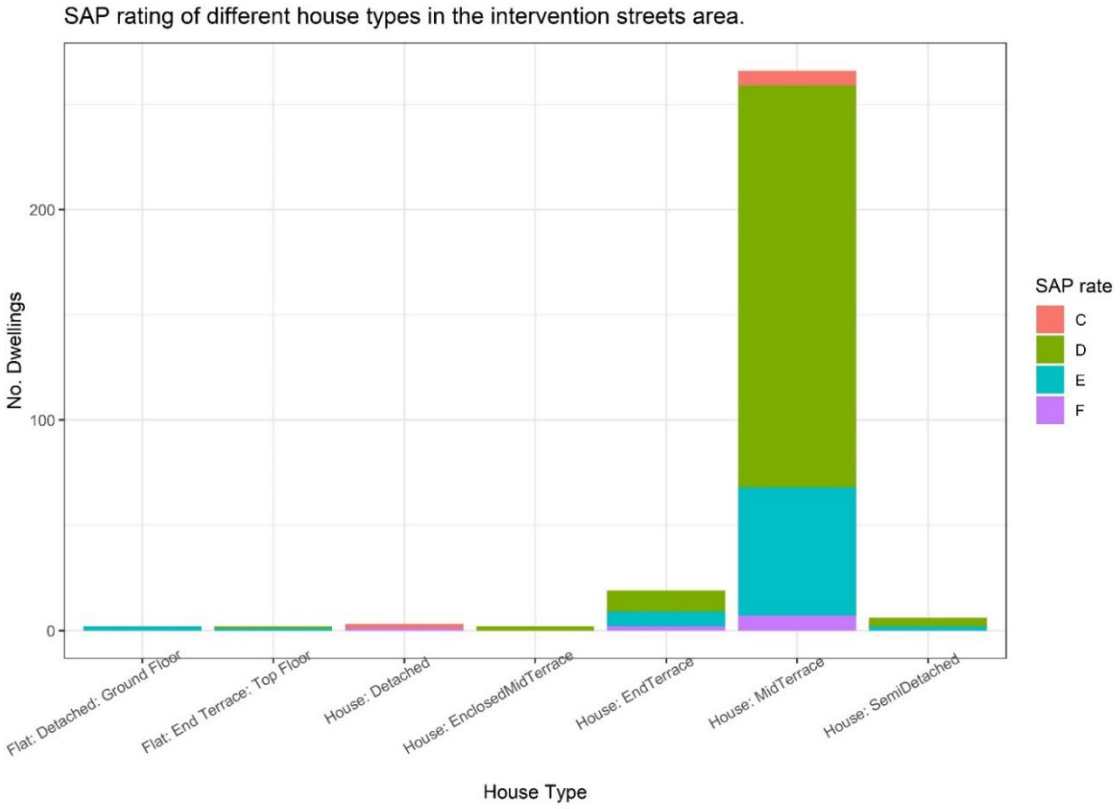


Figure A1.7.3: Roof construction and insulation details of different house types in the street-level demonstrator area (Source: Parity Projects 2022)

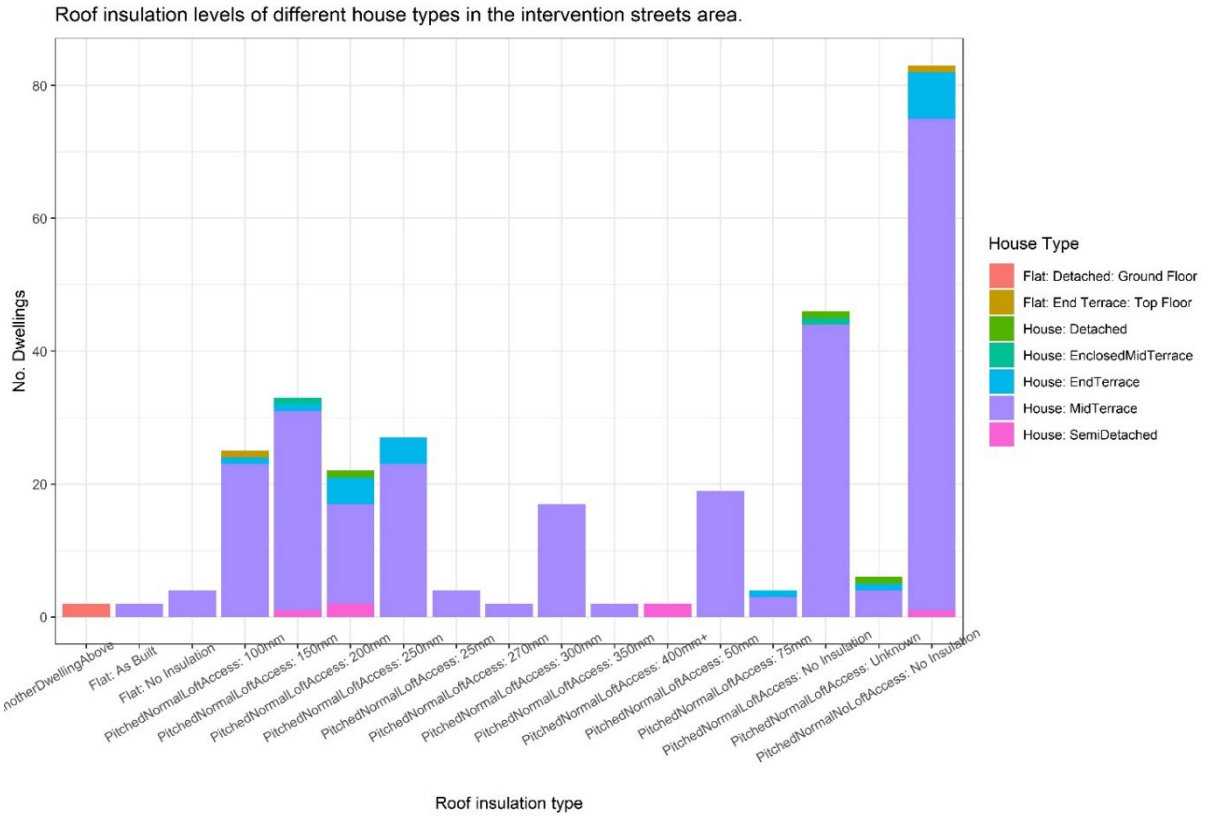


Figure A1.7.4: Wall construction and insulation details of different house types in the street-level demonstrator area (Source: Parity Projects 2022)

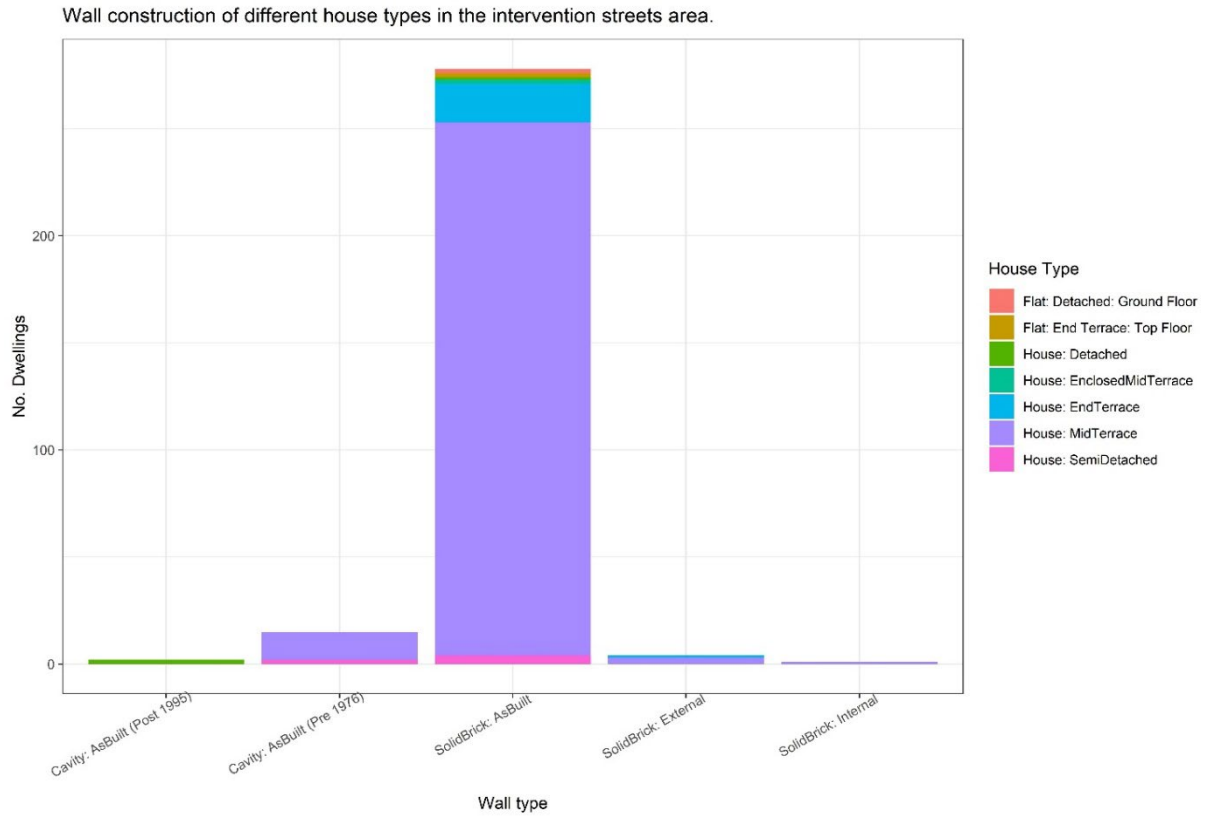


Figure A1.7.5: Estimated mean heating demand (kWh/m2) range and distribution in the street-level demonstrator area (Source: Parity Projects 2022)

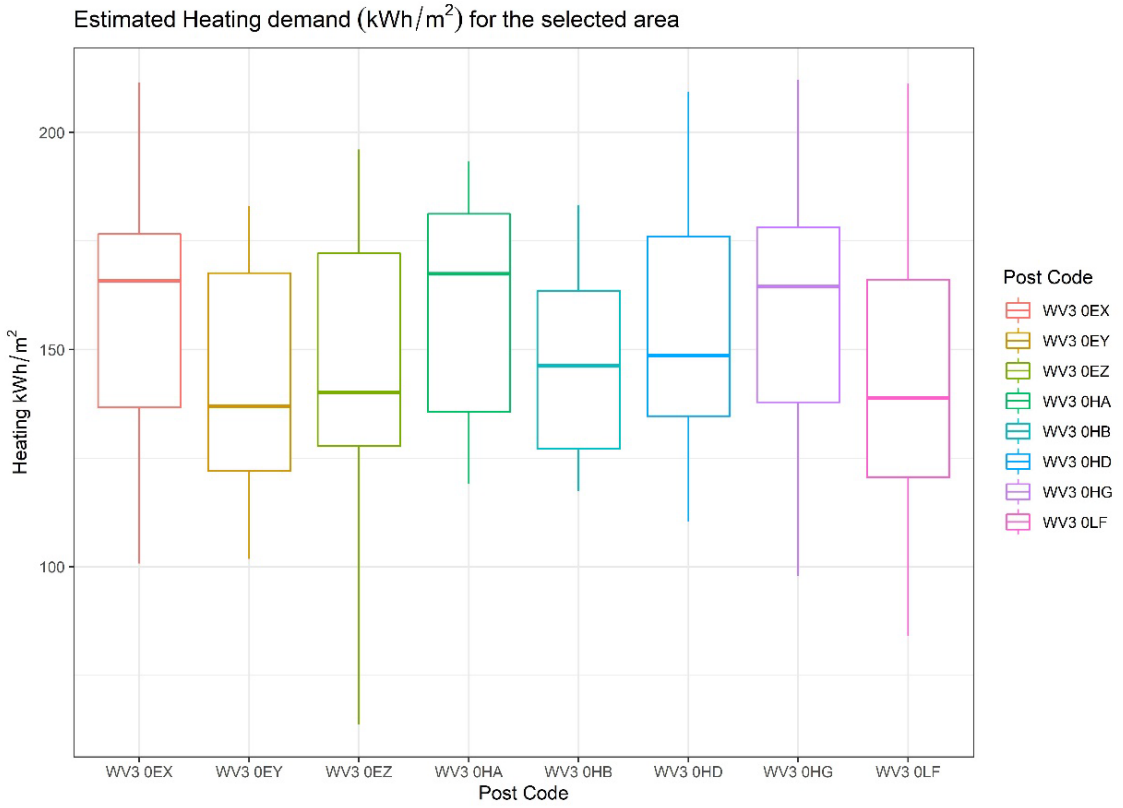
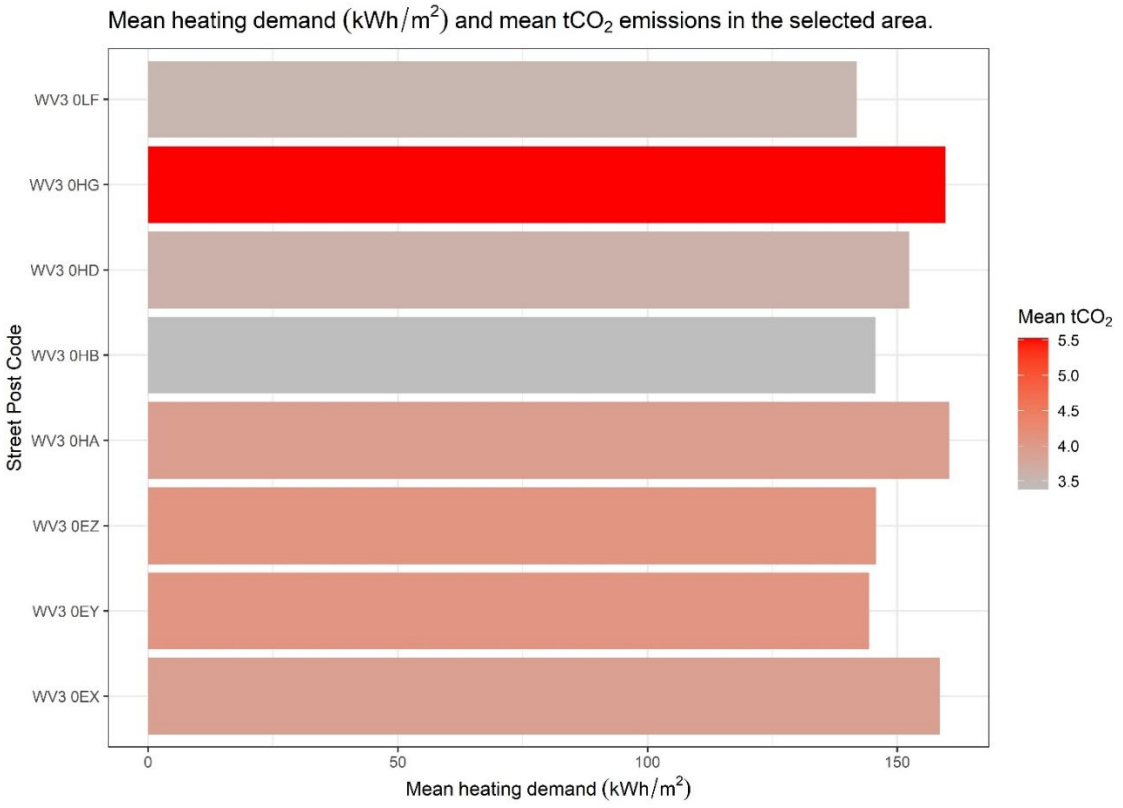


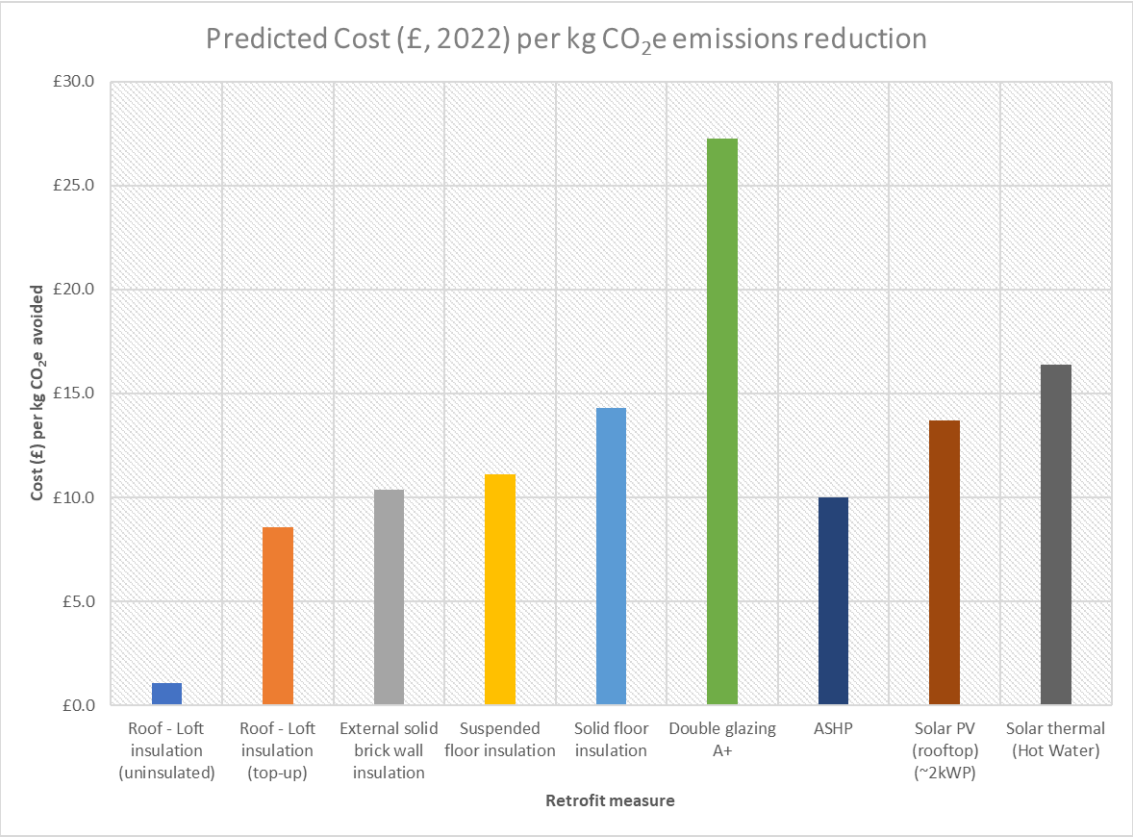
Figure A1.7.6: Estimated mean heating demand (kWh/m2) and mean carbon emissions (tCO2e) in the street-level demonstrator area (Source: Parity Projects 2022)



A.2 Modelling of Retrofit Projects

Ref	Intervention / measure	Physical Details	Applicability	Cost of interventions (£/measure)	Cost with optimising bias (+25%)	Effectiveness of interventions	Avg. CO_2 reduction (per measure)	Effectiveness of interventions	Impact to tenant	Cost effectiveness	Disruptiveness
		Category	No. dwellings affected	Assumed Capital costs (CAPEX)	Assumed Capital costs (CAPEX)	Energy demand (kWh) reduction per measure	kg CO_{2e} per measure (2022)	Energy reduction (kWh/m²) Assum. Avg. 88.5 m² floor area	Avg. Bill savings per year (£)	£ per kg of CO_2 saved (2022)	Level of disruption to occupants during application
1	Roof - Loft insulation (uninsulated)	Heat	129	£800	£1,000	4106	940	46.4	£160	£1.1	Low
2	Roof - Loft insulation (top-up)	Heat	133	£650	£813	415	95	4.7	£20	£8.6	Low
3	External solid brick wall insulation	Heat	266	£8,100	£10,125	4259	975	48.1	£170	£10.4	Medium
4	Suspended floor insulation	Heat	149	£1,600	£2,000	786	180	8.9	£30	£11.1	High
5	Solid floor insulation	Heat	146	£1,600	£2,000	611	140	6.9	£30	£14.3	High
6	Double glazing A+	Heat	291	£6,100	£7,625	1223	280	13.8	£50	£27.2	High
7	ASHP	Heat	300	£12,000	£15,000		1500		-£35	£10.0	Medium - High
8	Solar PV (rooftop) (~2kWP)	Electricity	119 (assumed	£4,000	£5,000	1720	365	19.4	£325	£13.7	Low
9	Solar thermal (Hot Water)	Heat	119 (assumed)	£4,500	£5,625	1500	343	16.9	£140	£16.4	Low

Data Source: Measures Ref. 1-7, Parity Projects Database, 50kWh/m² heat demand Scenario (Parity Projects 2022)
Source Ref 8: see section 4.4.3
Source Ref 9: https://cat.org.uk/info-resources/free-information-service/energy/solar-water-heating/ for example
Gas boiler efficiency assumed 80%
Typical floor area assumed 88.5 m²


Predicted Cost (£, 2022) per kg CO_2e emissions reduction
£30.0
£25.0
£20.0
£15.0
£10.0
£5.0
£0.0
Cost (£) per kg CO_2e avoided
Roof - Loft insulation (uninsulated)
Roof - Loft insulation (top-up)
External solid brick wall insulation
Suspended floor insulation
Solid floor insulation
Double glazing A+
ASHP
Solar PV (rooftop) (~2kWP)
Solar thermal (Hot Water)
Retrofit measure

A.3 Funding Review

A.3.1 Housing Retrofit and Energy

Name	Status	Description	Target	Scale	Delivery model	Applicability to street-level demonstrator
Local Authority Delivery Scheme Phase 3	Active, expires mar-23	Objective to improve the energy efficiency of homes of low-income households (under £30,000) living in specific local authorities. The scheme aims to improve low energy performance certificate (EPC) D to G rated homes. Measures may include improvements such as insulation, double glazing, replacing gas boilers with low carbon alternatives, and installing solar panels.	Low EPC rated homes (D to G) and Low-income households (under £30,000) or living in approved LA area	£54m in total for the Midlands Hub For eligible homeowners: up to £10,000 Private or social housing landlords with eligible tenants: up to £5,000 towards the cost of home improvements, on the condition to contribute at least a third of the cost	Midlands Net Zero Hub (beneficiary of the £54m fund) allocate funding to local authorities to deliver the LAD 3 (Local Authority Delivery Phase 3) scheme in their local area. Local authorities are delivering schemes with the support of local coordinators. Households are not in receipt of funding but benefit from works from "eligible installers".	Owner Occupied - 105, Private rented - 87, Social rented - 25 houses in selected area with EPC D to G. No income data but likely to be eligible. Funding has aleady been allocated to Blakenhall. There are 21 homes in Graiseley that have had retrofit assesments done, but not in the street level demonstrator area. Funding could be allocated towards a further 25 homes in Graiseley in the demonstrator area, which would mean around 90 homes in Blakenhall

Energy Company Obligation (ECO) 4 flex scheme	Mar-26	Offered and delivered by energy companies. Government energy efficiency scheme in Great Britain to help reduce carbon emissions and tackle fuel poverty. Interventions may include: ,- Cavity wall insulation - Gas boiler upgrade - Electrical heating upgrade - Loft insulation - Solid wall insulation - Improvement of doors and windows	Households receiving social benefits (meeting income criteria – see list here) Or living in social housing with an EPC rating of E, F or G.	.- £ 4 billion - EFG minimum target, increased to 150,000 private tenure homes - Target of 90,000 solid wall measures over the 4-year scheme - Target of 90,000 solid wall measures over the 4-year scheme - Repairs will be capped at 5,000 homes per year	Works paid for by the energy suppliers, no funds given to households	25 “rented social” jomes with D-G rating in Graiseley. In addition under Energy Company Obligation (ECO), the local council can expand the eligibility for those who may not meet the Benefit criteria with the ‘flexible eligibility’. Participating local authorities will have to ensure these are households in private tenure living either in fuel poverty or living on a low income and who are particularly vulnerable to the effects of living in the cold. In addition, some non-fuel poor homes will be allowed for solid wall insulation projects, if a proportion of the households in the project are in fuel poverty or living in the cold. Eligibility: household income is £30,000 and below, including housing costs. + list of additional criteria here Link: https://eco4.org.uk/local-authority-flex-delivery-scheme-lads/
ndSocial Housing Decarbonisation Fund - Wave 2	Guidance to be published in July/August 2022	Objective to improve the energy performance of social housing, delivering warm, energy-efficient homes and reducing fuel bills and carbon emissions for tenants. Upgrade homes to meet an Energy Performance Certificate (EPC) Band C standard. Upgrade homes through a worst-first, fabric-first approach using measures such as external wall, loft, cavity wall, and underfloor insulation. Some properties will also receive renewable technologies such as solar photovoltaic panels or air source heat pumps	Retrofitting 622 of the worst energy-performing properties across the region (Midlands) EPC rating from D to G Geography: West Midlands Combined Authority	£7.5m in total for the Midlands Hub as part of SHDF Total cost of retrofitting project: £14,7m with balance funded from housing association and local authority budget	Funds allocated to social housing providers – Registered Providers	Upcoming Social Housing Decarbonisation Fund wave 2: guidance still under development published in July August 2022 and competition from early September for 8 weeks – grants in 2023 – see timeline https://www.wmca.org.uk/news/wmca-led-consortium-is-awarded-75m-to-retrofit-social-housing/ https://www.midlandsnetzerohub.co.uk/retrofit/social-housing-decarbonisation-fund/

Heat Networks Delivery Unit - Round 12	Active, expires dec-22	The Heat Networks Delivery Unit provides support to local authorities in England and Wales through the early stages of heat network development: - techno-economic feasibility - detailed project development	Local authorities, RSLs, property developers, universities, NHS Trusts, property developers and other government departments can apply through bidding rounds	.- Up to 67% of externally commissioned consultancy costs for heat network development work. - Up to 100% of project management costs for public sector applicants and registered social landlords	Paid in advance by local authority or eligible organization and reimbursed + support from team of specialists within HNDU	Applicable in providing funding for feasibility work, could be taken advantage of to conduct development work during phase 1 for delivery in phase 2/ 3. However, managing another external commission will have an impact on resource that needs to be considered. https://www.gov.uk/guidance/heat-networks-delivery-unit#:~:text=The%20Heat%20Networks%20Delivery%20Unit%20provides%20grant%20funding%20and%20guidance,is%20currently%20running%20Round%2012
Green Heat Network Fund	Active, expires mar-25	The GHNF will provide capital grant support for both the commercialisation and construction of new low- and zero-carbon heat networks, along with the retrofitting and expansion of existing ones. Schemes must deliver low carbon heat at a volume of heat that is consistent with our strategic objectives for heat network market growth in England.	Organisations in the public, private, and third sectors who are responsible for the development of heating and cooling networks in England	Total fund: £288 million The GHNF will fund up to, but not including 50% of a project's total combined commercialisation and construction costs	Funding round applications (see guidance for timeline of rounds)	Applicability is time dependent, it could be relevant post phase 1, once feasibility studies have been undertaken. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1076541/ghnf-r1-scheme-overview.pdf
Smart Export Guarantee	Active	Payments for installing solar PV panels or other renewable electricity generation (ie. wind turbines, micro CHP) in home or business through the Smart Export Guarantee (SEG). Under the SEG, owner paid for every unit of electricity fed back into the grid from renewable system.	Any household owning a renewable energy installation	Payment based on energy put into the network and tariffs from energy suppliers	Commercial arrangement	Applicable as a benefit when calculating the fuel poverty benefits for residents that have solar PV. Typically between 3 - 7 p per kWh sold back to the grid, however in terms of direct grant funding it's probably not applicable.

Home Upgrade Grant Scheme 1 and 2	Active, expires mar-23	Objective to provide energy efficiency upgrades and low carbon heating to low income households that are living off-gas grid in England to tackle fuel poverty and reach net zero ambitions. Install low-carbon heating methods such as low-temperature pumps.	Low EPC rated homes (D to G) and Low-income households (under £30,000) or living in approved LA area	£28m in total for the Midlands Hub For eligible homeowners: £15,000 - £25,000	Midlands Net Zero Hub (beneficiary of the £28m fund) allocate funding to local authorities to deliver the HUG scheme in their local area. Local authorities are delivering schemes with the support of local coordinators. Households are not in receipt of funding, but benefit from works from "eligible installers".	Same applies as LAD3 but there is a limited number of off-gas grid homes in Graiseley.

A.3.2 Transport

Name	Status	Description	Target	Scale	Delivery model	Applicability to street-level demonstrator
Onstreet Residential Charging Scheme	Active, expires mar-23	The purpose of the scheme is to increase the availability of on-street chargepoints in residential streets where off-street parking is not available, thereby ensuring that on-street parking is not a barrier to realising the benefits of owning an EV. The scheme gives local authorities access to grant funding that can be used to part-fund the procurement and installation of on-street EV chargepoint infrastructure for residential needs. Based on application criteria - Priority to areas with particular air quality challenges - have not received Go Ultra Low Cities Scheme or other sources of funding for on-street residential infrastructure	Applicants must be a relevant local authority or authorities within the UK and have the explicit support of the relevant highway authority (or landowner) with responsibility for maintenance of the areas where the chargepoints are to be located	Total fund: £20 million of funding in 2022 to 2023 Funding up to 60% of eligible capital costs Total funding provided will not exceed £7,500 per chargepoint unless electrical connection costs are exceptionally high. In these cases, funding up to £13,000 per chargepoint	75% of the grant within around 25 working day and the remaining 25% of the grant upon completion of the project	£1.15m secured for Black Country for this financial year to deliver 315 chargepoints total. Ultralow emissions vehicle programme requires pprox 250 - 300 public EVCPs across wolverhampton, 14 dual socket chargers are planned for. https://www.gov.uk/government/publications/grants-for-local-authorities-to-provide-residential-on-street-chargepoints/grants-to-provide-residential-on-street-chargepoints-for-plug-in-electric-vehicles-guidance-for-local-authorities
City Region Sustainable Transport Settlement (CRSTS)	Active	The purpose of the scheme is to increase the quality of the local transport networks, particularly public transport of the 8 large metropolitan areas in England (excl. London). These settlements could be used to develop mass transit networks and sustainable (decarbonised) transport options, open up new areas of the region for employment, leisure and housing, and create real innovation in transport.	8 Metropolitan City Areas with local transport strategies including emissions targets and credible strategies to achieve them	Total fund: between £4.2 billion and £6.8 billion Local funds raised: £7m secured for 5 years to cover Black Country ULEV programme	Bid, funds unlocked and business cases to release funds	Wolverhampton: £7m secured for 5 years to cover Black Country ULEV programme, currently completing business case to release funds. https://www.gov.uk/government/publications/city-region-sustainable-transport-settlements-developing-proposals/city-region-sustainable-transport-settlements-guidance-for-mayoral-combined-authorities#scope-of-city-region-sustainable-transport-settlements

Local Electric Vehicle Infrastructure (LEVI) Pilot Funding		Local authorities and partnerships can apply to this fund to support the rollout of electric vehicle (EV) charging infrastructure. A £10million pilot fund is available, envisaged to support between 3 and 8 projects. Applicants will be supported in their application by the Energy Saving Trust, and the deadline to apply is 17 June.				Wolverhampton is not applying to this call but waiting for full scheme opening in the next financial year. https://www.gov.uk/guidance/apply-for-local-electric-vehicle-infrastructure-levi-pilot-funding

A.4 Cost Assumptions

The figures presented in this budget estimations are all capital expenditures and do not include maintenance costs. The figures include cost of design, materials and construction. The figures are based on industry standards such as CIRIA guides and government guidance as well as expert advice from Arup specialist and their project experience. These figures reflect costs at a fixed point in time and to the best of our knowledge at the time. Local conditions including availability of land, ground condition, surroundings, pre-existing development and global economic context will influence the costs. For SUDs, the low occurrence and non-systematic reporting of costs (design and construction) has led to a wider range of estimated figures in the industry. The estimates presented here are median average from a range of costs given in government guidance. It is worth noting that these are subject to variation and will not replace a feasibility and costing study. When costs had been estimated in the past, Bank of England guidance on the average annual rate of inflation for the period was applied to calculate the Future Value of those costs and reflect inflation.

Intervention	Source of cost estimation	Assumptions
Increase tree cover (ie. Tiny Forests)	The Cost of Everything Podcast. 'The Cost of a Tiny Urban Forest', 3 May 2021.	
Pocket rewilding	-	Cost assumed to be negligible / included in ordinary maintenance of public green space
Community allotments	-	
Sustainable Urban Drainage (alongside Manlove St., Fisher St. and Cardiff St.)		Assumption of the construction of a 1m width swale alongside 70% of the streets. SUDs costs were given for 2007 and a 2.3% average annual inflation rate was applied, in line with Bank of England guidance.
Sustainable Urban Drainage (Permeable pavement on part of reclaimed pavement alongside, Manlove St, Fisher St. and Cardiff St)		Assumption of the construction of a permeable pavement on the lanes reclaimed from the cars by transforming the streets into one-way streets. SUDs costs were given for 2007 and a 2.3% average annual inflation rate was applied, in line with Bank of England guidance.
Remediation of existing pavement and road	Worcestershire Council Highway Schedule Rates 2010	An additional blanket cost for general site clearance of £3 per square metre was applied as suggested in the guidance to account for miscellaneous item removals which are not included in the break up and removal of road surfacing. An average annual inflation rate of 2.0% was applied to all costs, in line with Bank of England guidance for inflation rate since 2010.

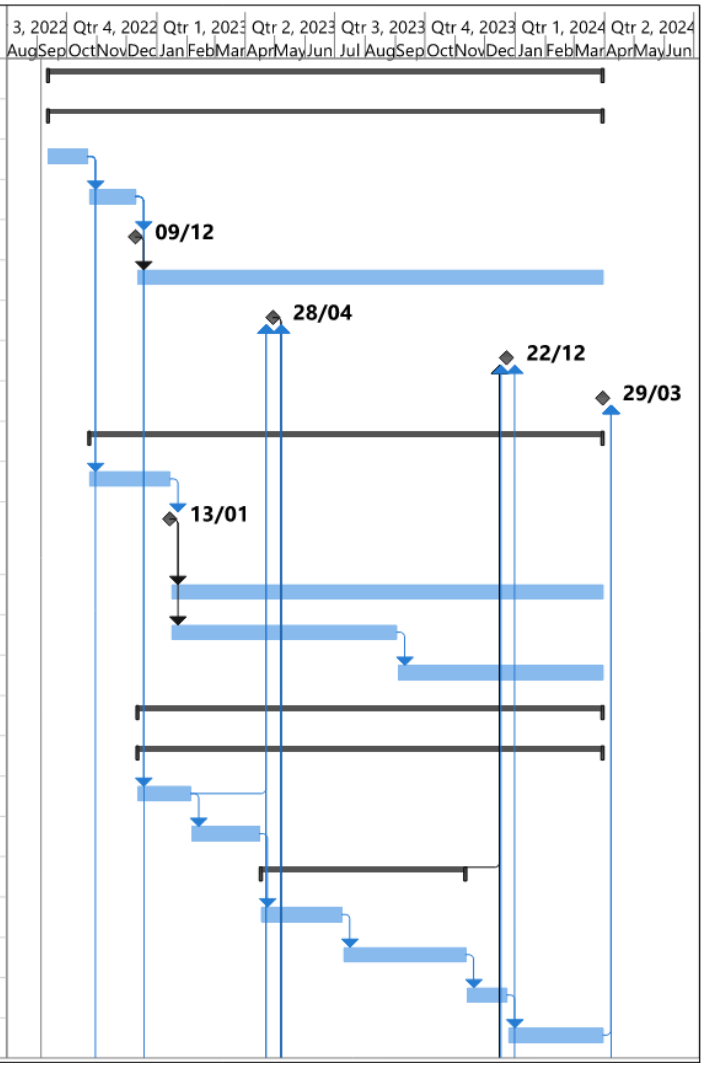
Intervention	Source of cost estimation	Assumptions
Expand EV charging provision	Internal Arup figures based on project precedent	£2,000 (slow charger)-£10,000 (rapid charge) per unit Use recommendation: Slow - Residents, workplaces (used here) Medium - Destination hubs: retail outlets, visitor parking (domestic and non-domestic) Fast - Delivery services, taxi ranks, car clubs
Increase / Better quality street lighting - Extend LED Lighting	Internal Arup figures based on project precedent	LED standard lighting columns are around £1,000-£2,000 to replace and install.
Bike storage facility (type cyclehoop)	Internal Arup figures based on project precedent	A Cyclehoop or other similar bike storage unit costs around £5,000 and a 15% uplift was applied to account for installation costs.
20mph zone with traffic calming measures (Lime st. 300m and Fisher st. 170m)	Internal Arup figures based on project precedent	£10,000 – £15,000 per km including traffic calming
One-way street with traffic calming intervention (Manlove st. and Cardiff st. 150m each)	Internal Arup figures based on project precedent	£10,000 – £15,000 per km including traffic calming
Walking bus	Internal Arup figures based on project precedent	£0 for volunteers – seek charity funding
Bike bus	Internal Arup figures based on project precedent	£0 for volunteers – seek charity funding

A.5 Risk Register

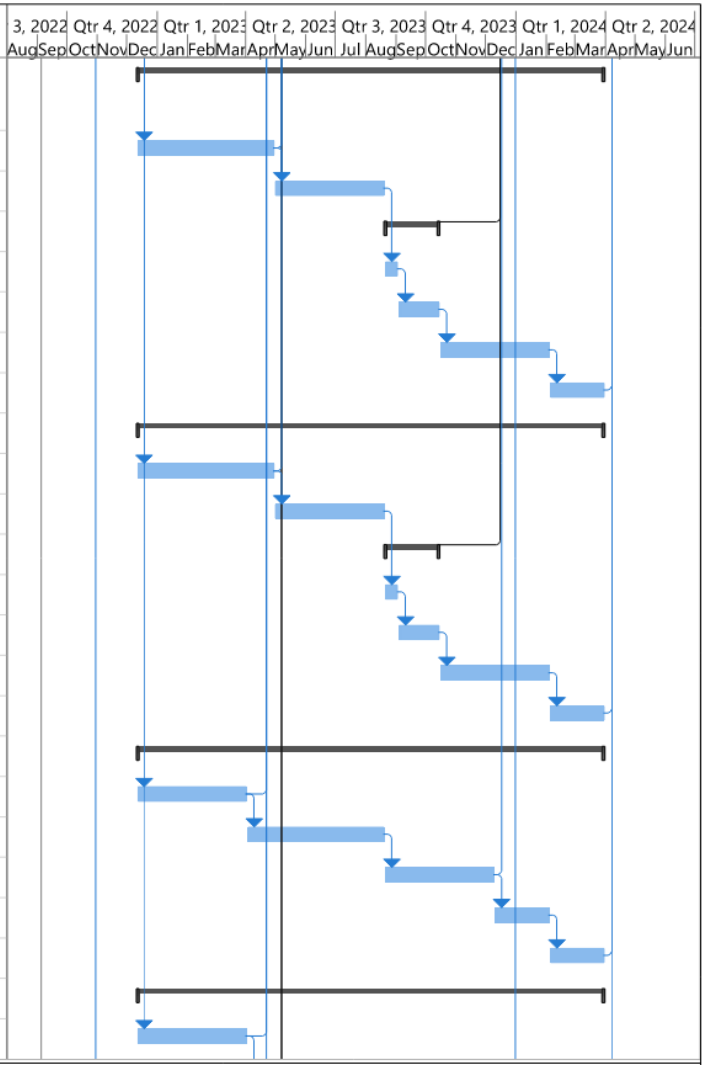
Risk Description	Impact	Mitigation
Energy calculations have utilised benchmark rates and costs, based on reasonable assumptions	There is a possibility that costs, and energy reduction is inaccurate at time of procurement and implementation	During planning stage, these calculations will be tested with alternative benchmarks, a contingency sum will be retained and, if necessary, prioritisation of interventions against capital investment plan will be undertaken to reduce scope. Governance arrangements will be utilised to confirm decision (remove, defer, seek alternative funding etc)
An assumption has been made that the majority of interventions at Phase 1 will utilise existing contracts	If this assumption proves to be incorrect, additional procurement time will be added to the programme	Engage with existing and new supply chains as soon as funding decision is made to reduce impact
Retrofit works cost assumptions, particularly regarding demand and supply chain constraints	Final cost may be higher than assumed according to Parity data, changing the number of measures which can be implemented in the selected area. Energy and carbon savings will be affected	An overhead of 25% increase (as separate column) has been added to calculations to allow for increasing inflation, overheads, and cost of building materials
Energy savings are based on technical expectations, but it is known that occupants' behaviour can offset a substantial percentage by increasing demand	The final, observed energy/carbon savings may be different than modelled reduction resulting in a rebound effect, i.e. increase in spendable income and comfort adaptation The social/wellbeing value may still be high	Arup BUS POE with comfort surveys have been used as part of the initial assessment. Post-retrofit evaluation will deliver evidence of any changes in satisfaction, wellbeing, comfort/health etc. These will be captured and analysed against carbon calculations, feeding into proposed interventions for future phases to meet NZN strategy
Time to carry out interventions is high within the industry and not acceptable to all residents	Not all residents will be willing to carry out retrofit measures where long periods of disruption or relocation are required	Investment in supply chain, local skills and community buy-in will be focused on in Phase 1 Innovative solutions such as creating a ’24 hour retrofit challenge’
Difficulties in gaining community consensus	Too many bespoke products and services, resulting in increased programme and time	Community engagement will start early, take advantage of existing knowledge to maximise time to achieve buy-in and define scope. Scope parameters will be kept in place to avoid too many bespoke interventions
Carrying out retrofit measures on social housing is generally quicker, however much of the housing in the pilot area is privately owned	Full extent of scope is not delivered and/or programme is extended agreeing terms with private homeowners	Early engagement with community to discover those willing. Incentives to be explored including competitions, council tax reductions etc.
Lack of energy capacity within local network	There may not be sufficient capacity of the local electrical infrastructure (for instance electrical infrastructure connecting homes to primary substations e.g. cables, secondary substations etc.)	Capacity to be verified There are options to help manage network constraints, including using digital monitoring, battery storage within homes and the potential to explore micro networks of battery storage in the area to create independent networks or working with DNOs as part of partnership arrangements

A.6 Net Zero Neighbourhoods Programme

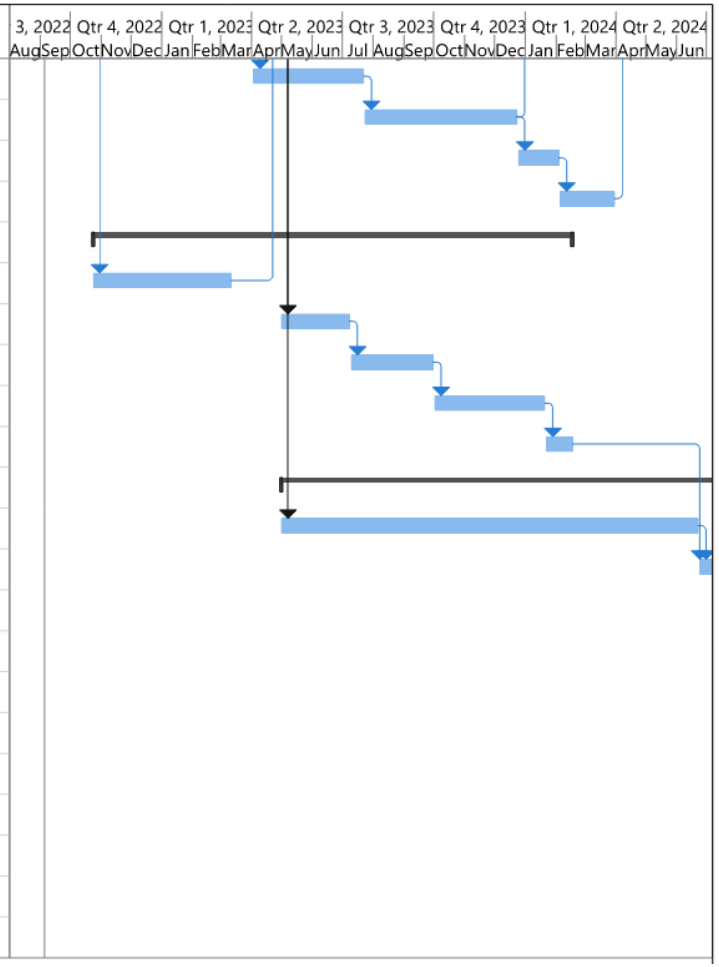
ID	Task Name	Duration	Start	Finish	Predecessors
1	**Phase 1**	**405 days**	**Mon 12/09/22**	**Fri 29/03/24**	
2	**Programme Management & Oversight**	**405 days**	**Mon 12/09/22**	**Fri 29/03/24**	
3	Team set-up	30 days	Mon 12/09/22	Fri 21/10/22	
4	Process & Tool set-up	35 days	Mon 24/10/22	Fri 09/12/22	3
5	Programme Board sequencing agreed	0 days	Fri 09/12/22	Fri 09/12/22	4
6	Ongoing Programme Management	340 days	Mon 12/12/22	Fri 29/03/24	5
7	Scope finalised	0 days	Fri 28/04/23	Fri 28/04/23	18,34,42,48,26,54
8	Scope delivered	0 days	Fri 22/12/23	Fri 22/12/23	20,28,36,44,50
9	Project Closed	0 days	Fri 29/03/24	Fri 29/03/24	24,32,40,46,52
10	**Community Engagement & Education**	**375 days**	**Mon 24/10/22**	**Fri 29/03/24**	
11	Customer research	60 days	Mon 24/10/22	Fri 13/01/23	3
12	Joint Neighbourhood Commitment/Charter in place	0 days	Fri 13/01/23	Fri 13/01/23	11
13	Engagement	315 days	Mon 16/01/23	Fri 29/03/24	12
14	Proposition development/initiative explorati	165 days	Mon 16/01/23	Fri 01/09/23	12
15	Feedback and improvement	150 days	Mon 04/09/23	Fri 29/03/24	14
16	**Buildings**	**340 days**	**Mon 12/12/22**	**Fri 29/03/24**	
17	**'at-scale' retrofit**	**340 days**	**Mon 12/12/22**	**Fri 29/03/24**	
18	Planning	40 days	Mon 12/12/22	Fri 03/02/23	4
19	Procurement	50 days	Mon 06/02/23	Fri 14/04/23	18
20	**Delivery**	**150 days**	**Mon 17/04/23**	**Fri 10/11/23**	
21	Survey	60 days	Mon 17/04/23	Fri 07/07/23	19
22	Onsite install	90 days	Mon 10/07/23	Fri 10/11/23	21
23	Monitoring	30 days	Mon 13/11/23	Fri 22/12/23	22
24	Project Closure	70 days	Mon 25/12/23	Fri 29/03/24	23



ID	Task Name	Duration	Start	Finish	Predecessors
25	**Deep retrofit (to be carried out alongside energy/heating interventions)**	**340 days**	**Mon 12/12/22**	**Fri 29/03/24**	
26	Planning	100 days	Mon 12/12/22	Fri 28/04/23	4
27	Procurement & Approvals	80 days	Mon 01/05/23	Fri 18/08/23	26
28	**Delivery**	**40 days**	**Mon 21/08/23**	**Fri 13/10/23**	
29	Survey	10 days	Mon 21/08/23	Fri 01/09/23	27
30	Onsite install	30 days	Mon 04/09/23	Fri 13/10/23	29
31	Monitoring	80 days	Mon 16/10/23	Fri 02/02/24	30
32	Project Closure	40 days	Mon 05/02/24	Fri 29/03/24	31
33	**Energy/Heating**	**340 days**	**Mon 12/12/22**	**Fri 29/03/24**	
34	Planning	100 days	Mon 12/12/22	Fri 28/04/23	4
35	Procurement & Approvals	80 days	Mon 01/05/23	Fri 18/08/23	34
36	**Delivery**	**40 days**	**Mon 21/08/23**	**Fri 13/10/23**	
37	Survey	10 days	Mon 21/08/23	Fri 01/09/23	35
38	Onsite install	30 days	Mon 04/09/23	Fri 13/10/23	37
39	Monitoring	80 days	Mon 16/10/23	Fri 02/02/24	38
40	Project Closure	40 days	Mon 05/02/24	Fri 29/03/24	39
41	**Transport & public realm**	**340 days**	**Mon 12/12/22**	**Fri 29/03/24**	
42	Planning	80 days	Mon 12/12/22	Fri 31/03/23	4
43	Procurement & Approvals	100 days	Mon 03/04/23	Fri 18/08/23	42
44	Delivery	80 days	Mon 21/08/23	Fri 08/12/23	43
45	Monitoring	40 days	Mon 11/12/23	Fri 02/02/24	44
46	Project Closure	40 days	Mon 05/02/24	Fri 29/03/24	45
47	**Environment**	**340 days**	**Mon 12/12/22**	**Fri 29/03/24**	
48	Planning	80 days	Mon 12/12/22	Fri 31/03/23	4



ID	Task Name	Duration	Start	Finish	Predecessors
49	Procurement & Approvals	80 days	Mon 03/04/23	Fri 21/07/23	48
50	Delivery	110 days	Mon 24/07/23	Fri 22/12/23	49
51	Monitoring	30 days	Mon 25/12/23	Fri 02/02/24	50
52	Project Closure	40 days	Mon 05/02/24	Fri 29/03/24	51
53	**Initiative Exploration**	**345 days**	**Mon 24/10/22**	**Fri 16/02/24**	
54	Targeted funding research	100 days	Mon 24/10/22	Fri 10/03/23	3
55	Planning & procurement	50 days	Mon 01/05/23	Fri 07/07/23	7
56	Feasibility studies	60 days	Mon 10/07/23	Fri 29/09/23	55
57	Trials carried out	80 days	Mon 02/10/23	Fri 19/01/24	56
58	Feedback and scope included for Phase 2	20 days	Mon 22/01/24	Fri 16/02/24	57
59	**Phase 2**	**770 days**	**Mon 01/05/23**	**Fri 10/04/26**	
60	Planning	300 days	Mon 01/05/23	Fri 21/06/24	7
61	Procurement	150 days	Mon 24/06/24	Fri 17/01/25	60,58
62	Delivery	200 days	Mon 20/01/25	Fri 24/10/25	61
63	Monitoring	80 days	Mon 27/10/25	Fri 13/02/26	62
64	Project Closure	40 days	Mon 16/02/26	Fri 10/04/26	63
65	**Phase 3**	**1040 da**	**Mon 20/01/25**	**Fri 12/01/29**	
66	Planning	400 days	Mon 20/01/25	Fri 31/07/26	61
67	Procurement	150 days	Mon 03/08/26	Fri 26/02/27	66
68	Delivery	300 days	Mon 01/03/27	Fri 21/04/28	67
69	Monitoring	150 days	Mon 24/04/28	Fri 17/11/28	68
70	Project Closure	40 days	Mon 20/11/28	Fri 12/01/29	69



ID	Task Name	Duration	Start	Finish	Predecessors
53	**Initiative Exploration**	**345 days**	**Mon 24/10/22**	**Fri 16/02/24**	
54	Targeted funding research	100 days	Mon 24/10/22	Fri 10/03/23	3
55	Planning & procurement	50 days	Mon 01/05/23	Fri 07/07/23	7
56	Feasibility studies	60 days	Mon 10/07/23	Fri 29/09/23	55
57	Trials carried out	80 days	Mon 02/10/23	Fri 19/01/24	56
58	Feedback and scope included for Phase 2	20 days	Mon 22/01/24	Fri 16/02/24	57
59	**Phase 2**	**770 days**	**Mon 01/05/23**	**Fri 10/04/26**	
60	Planning	300 days	Mon 01/05/23	Fri 21/06/24	7
61	Procurement	150 days	Mon 24/06/24	Fri 17/01/25	60,58
62	Delivery	200 days	Mon 20/01/25	Fri 24/10/25	61
63	Monitoring	80 days	Mon 27/10/25	Fri 13/02/26	62
64	Project Closure	40 days	Mon 16/02/26	Fri 10/04/26	63
65	**Phase 3**	**1040 day**	**Mon 20/01/25**	**Fri 12/01/29**	
66	Planning	400 days	Mon 20/01/25	Fri 31/07/26	61
67	Procurement	150 days	Mon 03/08/26	Fri 26/02/27	66
68	Delivery	300 days	Mon 01/03/27	Fri 21/04/28	67
69	Monitoring	150 days	Mon 24/04/28	Fri 17/11/28	68
70	Project Closure	40 days	Mon 20/11/28	Fri 12/01/29	69