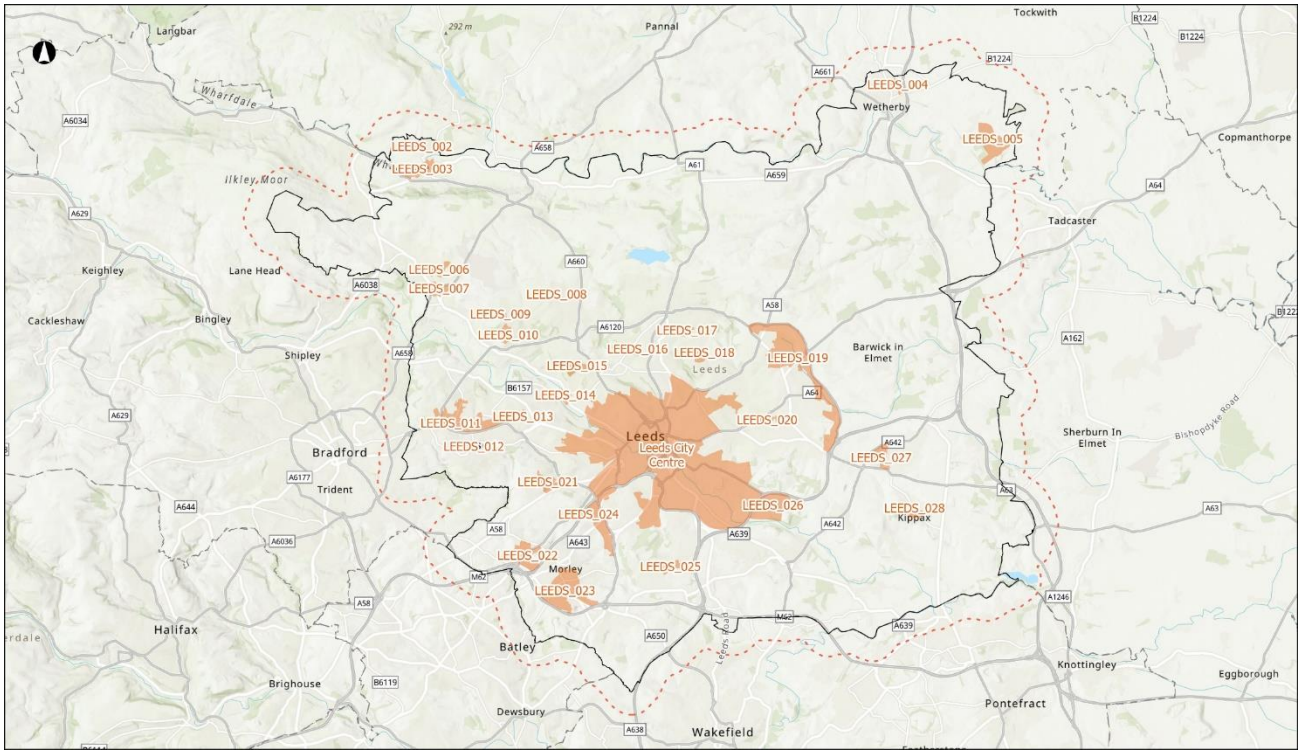
Department for Energy Security & Net Zero

Leeds

Heat Network Zoning

Zone Opportunity Report



February 2025

Disclaimer

Please read the following licence conditions thoroughly to understand your responsibility for use of this report and data presented within it.

This report contains outputs from the Heat Network Zoning Pilot Programme. The Pilot was undertaken prior to full details of the Heat Network Zoning policy being available. Therefore, the contents, including data shown in maps, technical and economic data within the report, are likely to change and potentially sensitive information is withheld. No part of this report shall be relied upon for any business decisions.

Acknowledgements

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Contents

Executive Summary

About Leeds: Leeds City Council is the local authority for Leeds, West Yorkshire, with a population of approximately 800,000 and an area of 551km².

Local Energy Policy: Leeds declared a climate emergency in 2019, aiming for carbon neutrality by 2030. The West Yorkshire Combined Authority targets a net zero carbon economy by 2038.

Existing heat networks: Leeds PIPES is the largest heat network, supplying heat to 3,000 homes and businesses. Networks are also planned for Aire Valley and South Bank. Leeds is a prioritised Advanced Zoning Programme (AZP) city.

Zones identified: 26 potential heat network zones were identified in Leeds, with heat demand across buildings required to connect totalling 1,100GWh/yr.

Strategic heat network zones: The Leeds City Centre heat network zone has a heat demand of 750GWh/yr from buildings required to connect. This includes the Leeds PIPES scheme and the South Bank and Aire Valley networks.

Key heat demands: The total annual heat demand for buildings connected to the initial zone opportunities identified is 325GWh/yr. Key buildings include St James's University Hospital, the University of Leeds and Leeds General Infirmary.

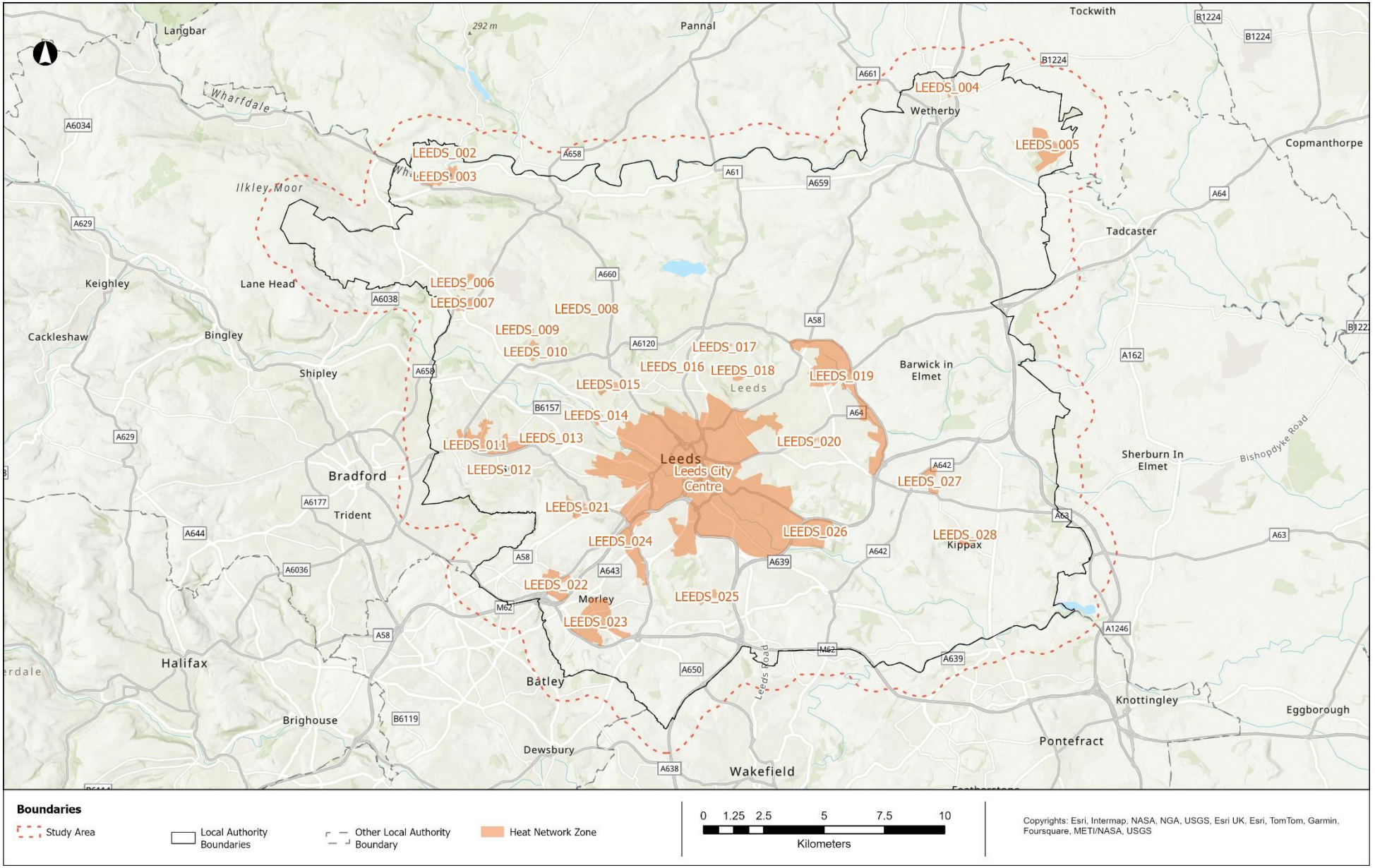
Key heat sources: Potential heat sources include connection to the RERF, waste heat recovery, water source heat pumps, and air source heat pumps.

Estimated CapEx: The high-level estimate of capital expenditure to network all buildings required to connect in all zones is approximately £2.1bn, of which the initial zone opportunities amount to approximately £600m.

Other heat network zones: Smaller heat network zones identified in areas like Morley, Farsley, and Whinmoor could be served by large-scale heat pumps.

Carbon savings: The initial zone opportunities identified could deliver carbon savings of more than 130ktCO_{2e} annually.

Figure 1: Overview of Heat Network Zones in Leeds



1) Introduction

Heat networks will play a crucial role in decarbonising heat in buildings. Heat networks take heating, cooling or hot water from a central source(s) and deliver it to a variety of premises such as public buildings, shops, offices, hospitals, universities, and homes. They are also an important part of securing the UK's energy independence through local, low carbon heat sources and reducing the cost of living through efficient, affordable heating in densely populated areas. Our analysis shows that heat networks could provide about 20% of total heat by 2050. They currently provide about 3%.

The Department for Energy Security and Net Zero (DESNZ) is enabling the development of heat network infrastructure through a range of targeted funding, policy and legislative support to de-risk projects and attract investment. The Energy Act 2023 establishes the regulatory framework for heat networks in Great Britain and provides powers to introduce heat network zoning in England through secondary legislation. A heat network zone (HNZ) is a formally designated geographical area in England where heat networks are expected to provide the lowest-cost solution for decarbonising heating.

Under heat network zoning, central and local government will work with industry and local stakeholders to identify and designate areas of England where heat networks are expected to be the lowest-cost solution to decarbonising heat. Heat network zoning will be essential to speeding up the development of new heat networks and we hope to catalyse growth where it's most needed.

Heat network zoning will significantly increase private sector investment in the sector by removing the barriers which currently limit the pace of developing large scale heat networks. It will also give local communities the tools to accelerate the development of heat networks in their own areas and ensure that more homes and businesses can have access to greener, cheaper heat. It also has the potential to create tens of thousands of jobs across the country.

This report shows the Pilot programme outputs for Leeds and is intended to showcase potential heat network zones in the city. The report indicates the heat network investment opportunity at a city scale, the potential location of heat network zones, and key opportunities for initial heat network development within those potential zones

Please note that all information presented in this report, including the location of identified heat network zones, is subject to change. These are the findings of Pilot programme that were developed alongside the emerging Heat Network Zoning policy and therefore reflect our understanding at a moment in time. As the methodology improves, we will update these reports to improve our understanding of how heat network zoning may be rolled out in each area. Any potential zones that are identified fully, or partly, in an adjacent local authority area will need to be discussed further once local zone co-ordinators are established.

Heat Network Zoning Pilot Methodology

Heat network zones will be identified using a standardised national zoning methodology[1]. The Heat Network Zoning Pilot Programme (hereafter Pilot programme) set out to develop a process to identify potential zones in a consistent and standardised manner across a range of towns and cities in England. The programme was fully funded and led by DESNZ, working alongside 28 Local Authorities, and multiple consultancy firms, to develop and test this approach at a local level. As such the final outputs are supported by each Local Authority but do not reflect an approved, endorsed, or adopted position on how zones may be delivered.

Lessons from the Pilot have been used to inform the development of the Heat Network Zoning policy. This includes improvements to the identification approach itself, but also wider policy design relating to the number and size of potential zones; existing heat networks; and the impacts of the policy on a range of stakeholders. Once the response to the heat network zoning consultation is published, we will update the methodology to reflect the final policy position.

The key concepts, definitions and complementary workstreams relevant to this report are introduced below. For a fuller description of the Heat Network Zoning policy, and up to date information regarding its implementation, please visit https://www.gov.uk/government/collections/heat-network-zoning.

Heat Network Zone Identification

Heat network zones will be identified using a standardised national zoning methodology. The December 2023 consultation on Heat Network Zoning proposes that the methodology will consist of two stages:

1. a national mapping exercise (using a data-led spatial energy model – the National Zoning Model, (or NZM), to identify indicative heat network zones across England;
2. a refinement stage where relevant local stakeholders will input to the review and refinement of potential heat network zones prior to formal designation.

For the purposes of this study, indicative heat network zones have been identified using a prototype version of the NZM. These indicative zones were then refined by technical consultants with input from local stakeholders. The NZM outputs are already of considerably higher quality than those shared for this work and therefore these reports will improve over time.

This study split heat network zones into two different categories. These are **'strategic'** zones – the largest zones which are generally seen as strategically significant to developing heat networks in an area; and **'other'** zones – which are generally smaller and discrete. These are terms specific to the Pilot programme and the report focuses primarily on the strategic zones.

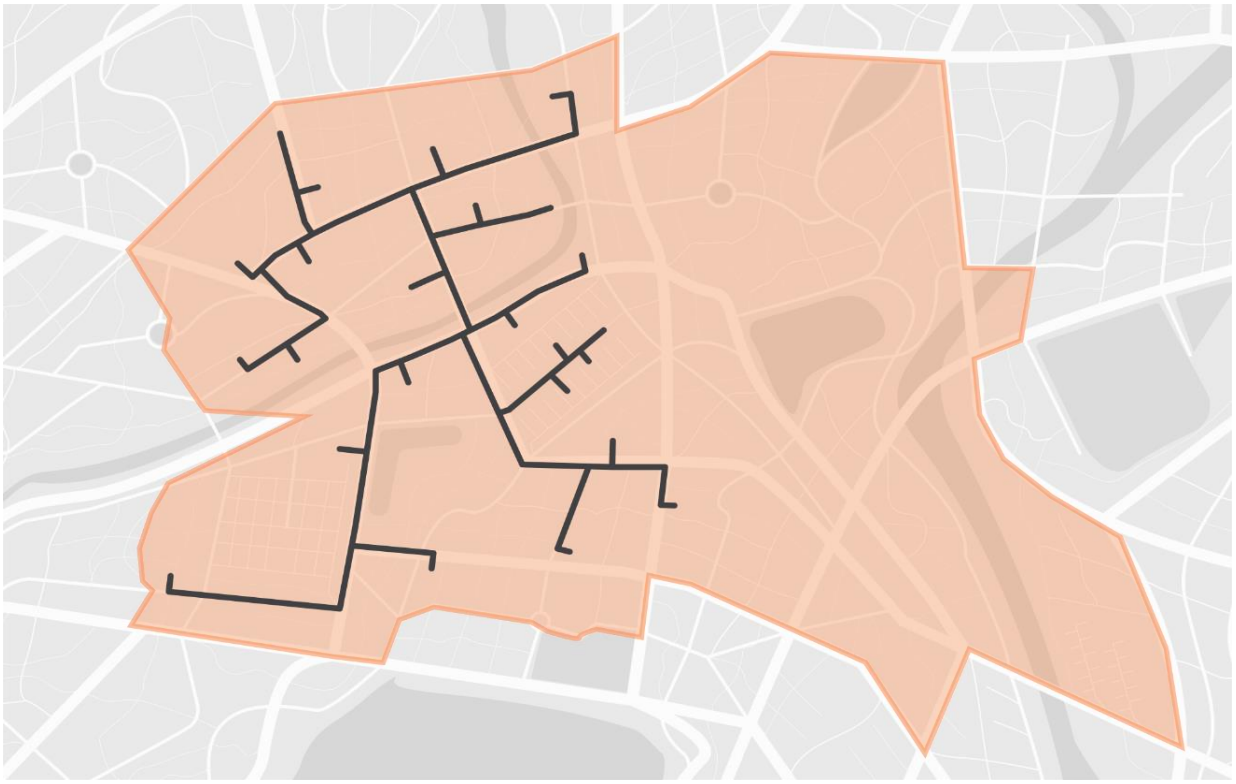
[1] More information can be found in the Heat Network Zoning Methodology Statements (Appendix 3, 4 & 5)

Initial Zone Opportunities

Alongside the identification of potential heat network zones, the Pilot programme has attempted to define areas within zones where the most attractive heat network development opportunities might exist. For the purposes of this programme *only* these are called an "initial zone opportunity" (or IZO). The approach considered economic viability, investment scale and returns, decarbonisation impact and deliverability. They were developed solely around buildings which could be required to connect[2] under the proposed Heat Network Zoning policy and did not consider potential voluntary connections.

Initial zone opportunity design targeted a linear heat density (LHD) of 4MWh/m/yr, for the existing built environment. This is considered a relatively low proxy for economic viability with the heat network sector in England. A more flexible approach was used for new development sites, where different economic success criteria are likely to be applied. To standardise the way opportunities were assessed, the IZOs presented in this report may differ from, or overlap with, existing or planned heat network infrastructure. Campus style heat networks (e.g. in hospitals or university campuses) were considered as potential heat loads with a single point connection. Figure 2 below shows an example of a heat network zone and an IZO.

Figure 2: Illustration of a Heat Network Zone (HNZ) and an Initial Zone Opportunity (IZO)



[2] The building categories being considered as required to connect include new developments, large non-domestic buildings, and communally heated residential blocks as described in Heat Network Zoning Consultation (2023)

Study Scope

This document is presented as a zone opportunity report as it was developed in advance of the final policy design. As such, the report does not include:

- references to the **central authority** or **zoning co-ordinator** roles;
- assumptions about rights of **existing heat networks,** or **zone delivery areas**;
- an options appraisal on which **routes to market** may be taken;
- calculations on the **cost of heat** (connection/tariffs) to specific buildings**;**
- any inferences as the suitability for **public/private sector delivery** unless it's matter of fact (existing network or Heat Network Investment Project/Green Heat Network Fund project);
- references to **local community benefit** or **consumer protection** (subject to a live consultation).

In the future, it is intended that a document, similar in style, will be produced to incorporate these policy design aspects and be used as a Zone Market Prospectus (ZMP) to market heat network zoning opportunities in an area. Further detail on the methodology and initial zone opportunity criteria is provided in Appendix 4 and Appendix 5.

Advanced Zoning Programme

The Advanced Zoning Programme (AZP) is working with 19 areas to support the construction of new zone scale heat networks as quickly as possible following the launch of heat network zoning in 2025. Amongst the programmes aims are to accelerate the delivery and construction of heat network zones; develop best practice guidance; provide project development support services; and promoting market transformation ready for the national rollout of Heat Network Zoning policy.

The programme builds upon lessons learnt from the Pilot programme and these outputs. In October 2024, DESNZ announced that ground-breaking heat network schemes in Leeds, Plymouth, Bristol, Stockport, Sheffield, and two more in London will receive prioritised support to advance to construction by the end of 2026.

AZP uses the latest zoning methodology (i.e. developed after the Pilot programme) and has undertaken further detailed development work with local stakeholders to further improve confidence and accuracy. The programme may also have applied local strategic and commercial considerations and therefore the opportunities may differ slightly from those presented here, using a national standardised approach. Where there is overlap, AZP studies should be considered more appropriate for use than the outputs from this Pilot programme.

2) Leeds Heat Networks Context

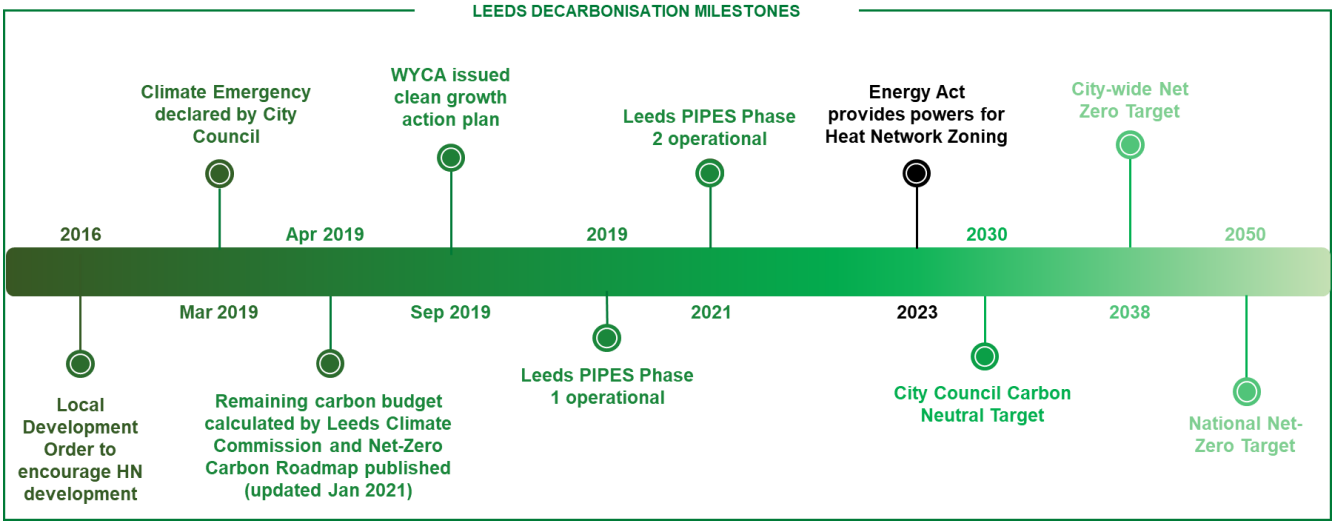
2.1) Leeds City Overview

Leeds City Council (LCC) is the local authority of the City of Leeds and is one of six councils that make up the West Yorkshire Combined Authority (WYCA). Leeds is a city in Yorkshire with a population of approximately 800,000 people and an overall area of 551km^2, making it the fifth biggest city in the UK by area. The city has a densely populated urban subdivision area of 112km^2, with the rest of LCC's jurisdiction less densely populated. LCC own approximately 54,300 social homes, with a further 20,000 homes owned by other social landlords.

2.2) Leeds Net Zero Targets and Commitments

In 2019, LCC declared a climate emergency and set out a commitment to make Leeds carbon neutral by 2030. The work of LCC and Leeds Climate Commission has placed Leeds at the forefront of city-led climate action and led to the creation of the UK-wide Place-based Climate Action Network. In 2019, the Leeds Climate Commission calculated the remaining carbon budget for the city. The Leeds Carbon Roadmap raised carbon reduction targets for the city and demonstrated that a 70% emission reduction on 2000 levels are required by 2025 and an 85% reduction by 2030. In 2019, WYCA issued its clean growth action plan committing the city region to achieving a net zero carbon economy by 2038 at the latest. Figure 3 summarises key dates in LCC's plans for decarbonisation and demonstrates their progress towards targets.

Figure 3: Leeds Decarbonisation Milestones



2.3) Delivering Heat Networks in Leeds

Leeds PIPES is the largest heat network in the city, supplying heat to over 3,000 council homes and businesses around Leeds city centre. The network is operated by Vital Energi and

uses heat and energy recovered in the Leeds Recycling and Energy Recovery Facility (RERF), an energy from waste (EfW) plant in Cross Green, which is operated by Veolia. LCC have recently approved plans to invest in extending the Leeds PIPES heat network by 2.5km.

LCC introduced a Local Development Order in 2016 to encourage the development of heat networks over the long term. LCC have since explored the potential for heat network deployment in the South Bank area, through a new network which could connect to Leeds PIPES. LCC commissioned a Detailed Project Development (DPD) study which outlined the potential for a heat network which utilises waste heat from the Verallia glass manufacturing plant and local data centres to supply the areas of significant planned development. This work has been used to support a Green Heat Network Fund (GHNF) application for the development of this network. A new heat network is also being planned in the Aire Valley region, where SSE are planning to connect a new EfW plant to a heat network scheme in Skelton Grange. The EfW plant is currently under construction and is scheduled for completion in 2025.

There are also several communal heating schemes distributed throughout the city, though these are not considered of sufficient scale to affect the strategic development of the zone.

Please refer to Appendix 2: Data Room Resources for further information about the evidence compiled for heat network opportunities in Leeds. This includes a stakeholder directory and records of interactions with those stakeholders as well key studies and reports.

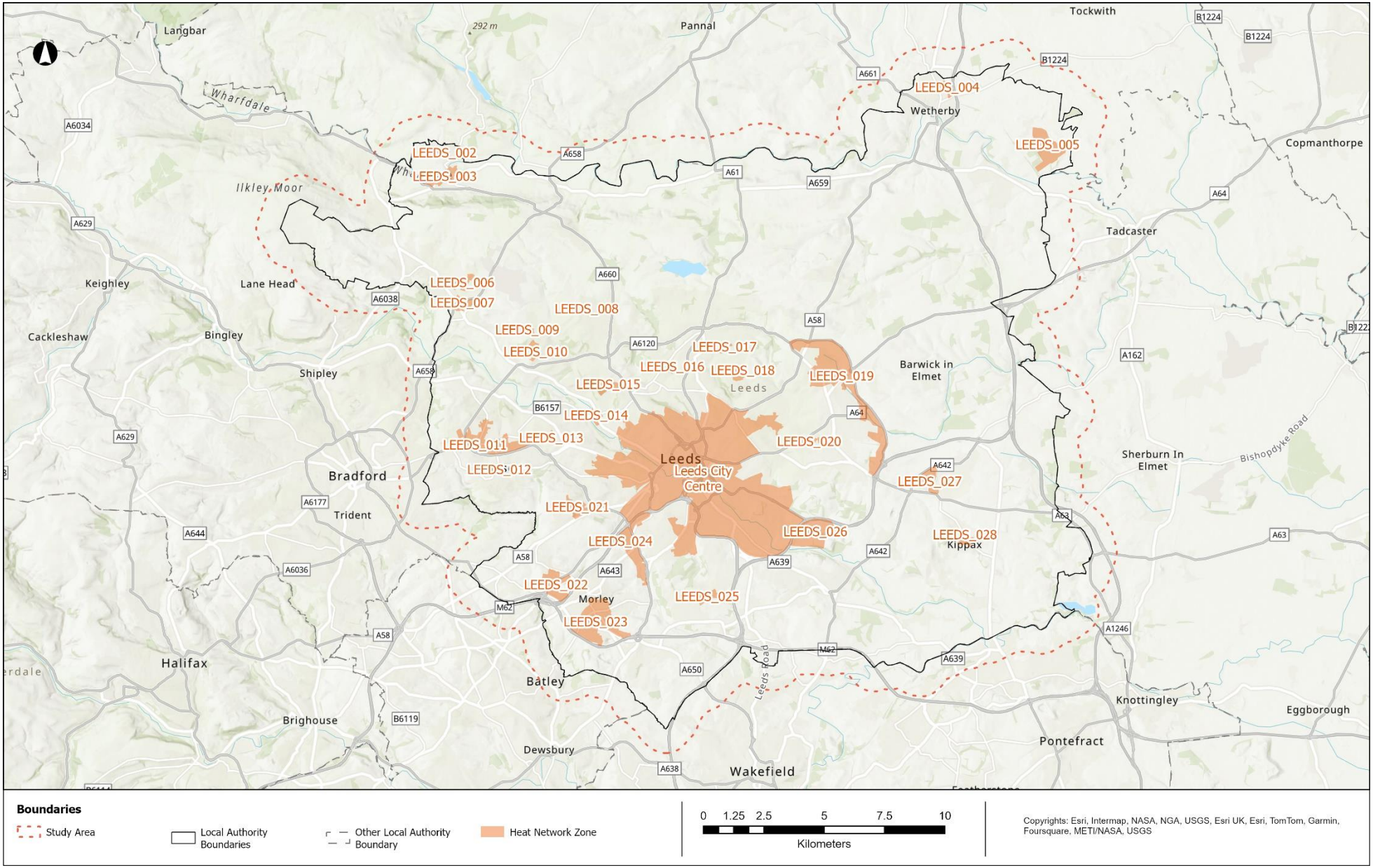
2.4) Leeds Heat Network Zones

A total of 26 potential HNZs were identified in Leeds, with one considered a Strategic HNZ. Figure 4 below shows the study area boundary, including the boundaries of all HNZs identified within Leeds. Strategic HNZs have been allocated a meaningful name agreed as relevant from a local perspective whilst Other HNZs have a reference number allocated instead. In both cases, these names are shown on the map.

Please see Appendix 1 for the following maps giving more detail:

- A: City Typology Map – shows building typologies which dominate by area.
- B: Key Heat Loads Map – highlights key buildings required to connect by heat demand.
- C: Key Heat Sources Map – highlights key heat sources by type and potential energy centre locations as well as any existing district heat network energy centres.
- D: Existing / Planned Heat Networks Map – shows existing heat networks, planned extensions, and planned networks at an advanced development stage.
- E: Key Constraints Map – shows key topographical constraints identified.
- F: Off-gas Grid Areas – presents areas with differing levels of properties off the gas grid within the study area.
- G: Coal Mine Authority Map - shows area where coal mine water may be a possible heat source.

Figure 4: Heat Network Zones Identified within the Leeds Study Area



3) Strategic Heat Network Zones

Strategic HNZs in Leeds

This section examines the strategic HNZ and IZOs identified within it. This covers the key heat demands, heat sources, energy centre locations and potential constraints. Heat network distribution routes are conceptual and designed to illustrate the potential size and scale of the heat network opportunity that may be realised as part of the upcoming Heat Network Zoning policy. Other heat network zones are listed in Section 4.

Table 1 below presents a high-level estimate of the scale of opportunities across Leeds. Please refer to Appendix 4 for more detail.

Table 1: Annual Heat Demand for Buildings in All Zones, Strategic Zones and IZOs

Scope	Annual heat demand (GWh/yr)
All buildings required to connect in all zones[3]	1,100
All buildings required to connect in strategic zones	750
All buildings connected to the IZOs	325

Existing/planned heat networks that overlap with IZOs are described, though their locations may vary due to different approaches. The Pilot programme applied a standard set of technical and economic assumptions across each of the 28 areas that participated in the programme and uses a proxy for economic viability, see Section 1 and Appendix 4 for more detail. Existing and planned networks will often be based on more detailed design work and have taken account of strategic and commercial considerations that were relevant at the time of their development. Future iterations of this report will consider how to better align local studies whilst retaining a nationally consistent approach.

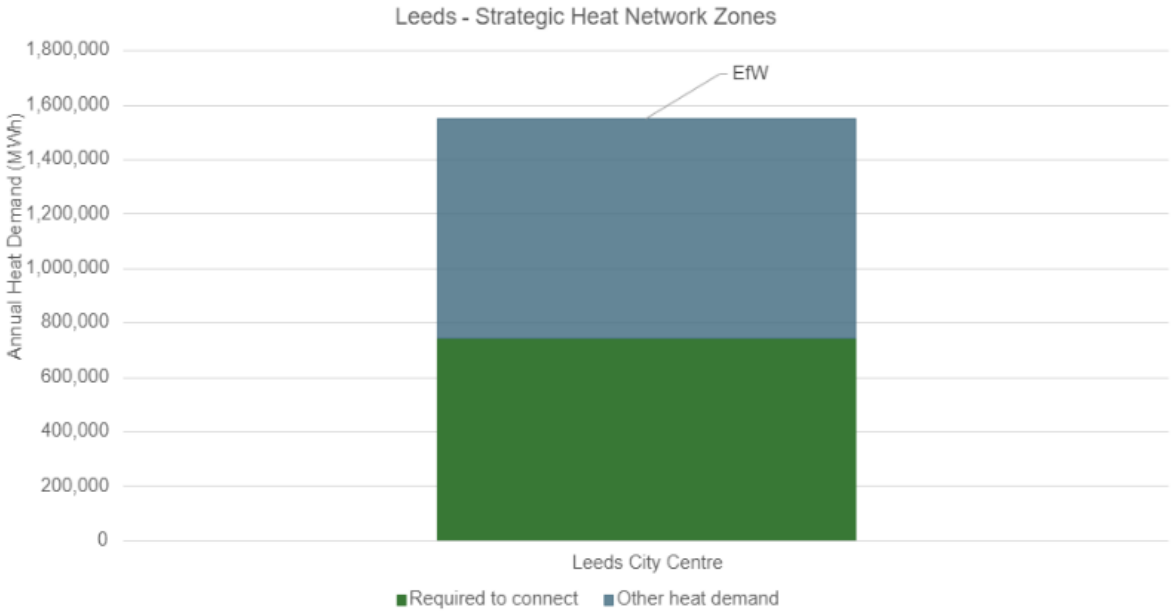
The strategic zone is summarised below. Figure 5 illustrates its size, alongside the key potential heat source and the proportion of buildings that may be required to connect.

Leeds City Centre is the largest potential HNZ identified by heat demand and area and includes three IZOs. This HNZ captures some of the largest buildings required to connect in the city, including university and hospital buildings, and a significant area of planned development to the south-east. Low carbon heat sources which could supply a heat network within the zone include the Leeds RERF, the Skelton Grange EfW plant, water source heat

[3] Row 1 is an estimate of heat demand across buildings required to connect in all zones identified. Row 2 is as per row 1, but only within strategic zones. Row 3 includes buildings connected to the IZOs described and largely comprise of buildings potentially required to connect. Figures are generally rounded up to the nearest 25 or 50GWh/yr.

pumps, and industrial waste heat recovery. The zone also encompasses the existing Leeds PIPES scheme and planned Skelton Grange and South Bank heat networks.

Figure 5: Summary of Heat Demands in the Strategic HNZ Identified



3.1) Leeds City Centre

3.1.1) City Centre – HNZ Summary

Leeds City Centre is the largest zone identified by both heat demand and area in Leeds. The zone includes many significant buildings potentially required to connect including St James's University Hospital, University of Leeds, and Leeds General Infirmary. The Leeds PIPES scheme is an existing network within the zone, providing a spine from the Cross Green Industrial Park to the city centre.

In total, there are 2,015 buildings potentially required to connect in this zone, excluding planned developments such as those within the Aire Valley Action Plan. There is a concentration of large commercial buildings in the centre of the zone, primarily consisting of offices, retail, hospitals and hotels. Many of the large publicly owned buildings in this area are connected to the existing Leeds PIPES network, however, there is significant opportunity in the future for infill connections to the large private buildings that may be required to connect under the HNZ policy.

The southern boundary of the zone extends as far as White Rose Office Park and Parkside Industrial Estate. To the north it encompasses residential areas surrounding Woodhouse Moor and portions of Chapeltown. Western portions of the zone include demands in the Burley and Armley areas. The eastern area includes the Skelton Grange site.

Two EfW plants represent the primary low-carbon heat-sources in this zone. Both have significant capacity, offering continued potential to expand the networks they serve. Skelton Grange will be serving an area of relatively low absolute heat demand, thus, there may be potential to expand this network, once developed, into the city centre. Vital Energi currently have a non-compete clause within the vicinity of Leeds PIPES, while SSE has a similar clause in the Aire Valley area. Therefore, plans for future interconnection are currently limited to the provision of resiliency.

Additional low-carbon heat opportunities in the zone include industrial waste heat recovery from the Verallia glass manufacturing centre and data centre heat recovery in the South Bank area. There is also heat source potential from the River Aire and ground source potential or mine water extraction opportunities from green spaces across the city, however, these would all require further investigation into practicality and viability.

Key constraints within the zone are the River Aire, which runs through the city centre, and the principal railway lines to/from Leeds Train Station.

3.1.2) City Centre - Existing Heat Networks

The existing and planned heat networks are described below and shown in Appendix 1: Map D. There is one large operational heat network which has plans for further expansion and two new planned heat networks within this zone.

Operational Heat Networks and Planned Expansions

Leeds PIPES (Phases 1&2)
Leeds PIPES is the most significant heat network in Leeds, supplying low carbon heat from the RERF to over 3,000 homes and public buildings. The scheme has been developed by Vital Energi in phases since 2018 with 26.5 km of heat network pipe installed to date and over £47m of capital investment.

Leeds PIPES (Phase 3)
LCC has recently completed phase 3 of the Leeds PIPES networks which extends the network by 2.5 km. Phase 3 adds several connections including St James's University Hospital, Leonardo/Thoresby student residential accommodation, Old Technology Campus student residential accommodation, and Lovell Park multi storey flats.

Planned Heat Networks

Skelton Grange
The Skelton Grange EfW facility to the south is currently under construction and expected to be completed by 2025. This facility will be connected to a major new £25m heat network being planned in the Aire Valley region. The development of this network is being led by SSE and is subject to a GHNF application.

South Bank

Advanced Zoning Programme:

A £55m+ heat network project is proposed in the South Bank area, one of Europe's largest brownfield redevelopment sites. This may serve as an extension to the existing Leeds PIPES network. LCC secured £24.5m from the GHNF in December 2023. The network plans to connect to 28 buildings, with up to 8,000 residents and mixed-use customers benefitting from connections.

The project aims to use waste heat from a glass factory and water source heat pumps, utilising the River Aire. Air source heat pumps and electric boilers will provide peak heating and backup. A significant portion of construction and spending is planned for 2025/26. The wider opportunity in the South Bank area is estimated at over £200m.

3.1.3) City Centre - Initial Zone Opportunities

Three discrete IZOs were identified in the City Centre zone. Potential routing[4] for the IZOs are shown in Figure 5 and summary statistics provided in Table 2.

[4] Routes can be expected to change as a better understanding of local constraints is developed through design.

Table 2: City Centre - Summary Statistics for Initial Zone Opportunities[5]

CapEx	Heat	Network	CO_{2e} savings	LHD	Heat Sources
>£650m	>325GWh	100km	50ktCO_{2e}/yr	3.3MWh/m	EfW, Waste Heat Recovery, River WSHPs

The **Central Area IZO** reflects the existing coverage of the Leeds PIPES network, spanning from the Cross Green Industrial Estate in the east (where is makes use of the RERF as a heat source) to the western edge of the ring road, where it crosses the river to supply several areas of planned development. The Central Area has a concentration of large commercial buildings, primarily consisting of offices, also with retail, hospitals, and hotels, which presents a diverse and dense heat demand. The IZO demonstrates the potential for policy to unlock additional infill and new connection opportunities in this area, with a total annual heat demand of around 200GWh/yr.

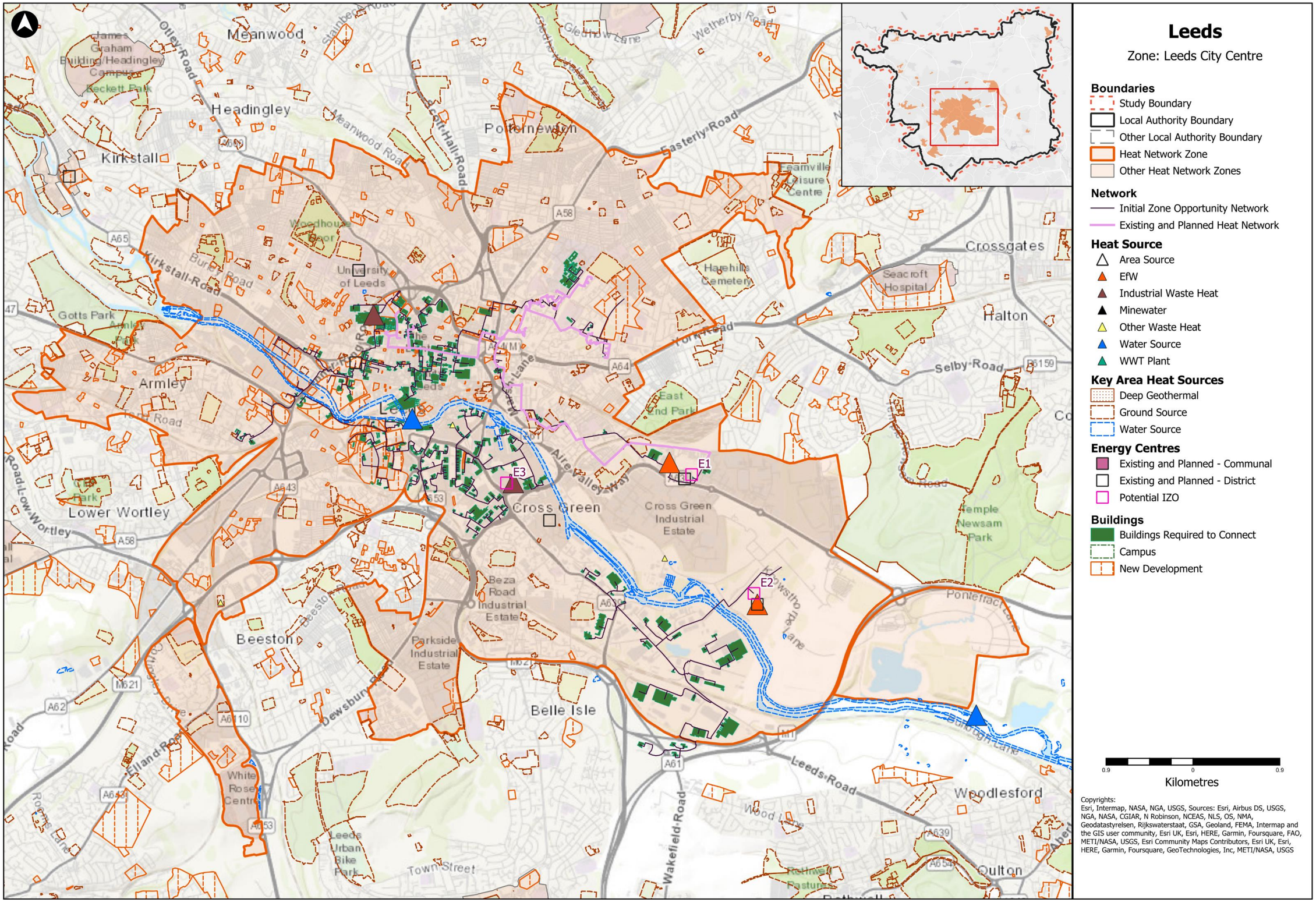
The **Skelton Grange IZO** is to the east of the city centre and is split into a north and south divide by the River Aire. The area is predominantly non-domestic buildings consisting of a mixture of industrial and office spaces, with key anchor loads including Knostrop Wastewater Treatment Works. The IZO identified is a new network connecting to the new EfW facility, crossing the River Aire and supplying the surrounding commercial and industrial loads. It connects an annual estimated heat demand of approximately 46GWh/yr.

This IZO reflects a planned network currently under development by SSE (see Section 3.1.2). The IZO demonstrates the opportunity for policy to unlock further connections and expansion of this network.

The **South Bank IZO** is south of Leeds's city centre, on the other side of the River Aire. In addition to existing areas of high-density commercial and retail buildings, it includes significant planned residential developments around Holbeck Urban Village. The IZO identified is a new network connecting these retail and residential demands, supplied by two waste heat sources. There is also potential for a future water source heat pump (WSHP) extracting heat from the River Aire. In total, the IZO connects an estimated annual heat demand of around 84GWh/yr. This IZO reflects a planned network currently under development (see Section 3.1.2).

[5] Please see Appendix 3 – Glossary, "Specific definitions" of the main report for definitions related to Table 2Table 2.

Figure 6: Initial Zone Opportunities in City Centre HNZ



3.1.4) City Centre – IZO Heat Demands

The heat demands identified within the three IZOs are described below. The Pilot programme used several sources including local data collected from building owners; national energy demand datasets; benchmarks applied via the National Zoning Model (NZM); and a standardised approach to estimate the potential heat demands of new development sites. More information is provided in Appendix 4.

Where there are different values between datasets, the methodology prioritised the use of the early prototype version of the National Zoning Model, for consistency. This has led to an overestimation of some commercial and light industrial heat demands presented in this report. Large anchor loads that are already connected to existing district-scale heat networks are not listed.

The **Central Area IZO** has a diverse and dense heat demand, with a large concentration of existing buildings giving high confidence in the overall opportunity.

The estimated annual demand for the IZO is approximately 200GWh/yr. A breakdown of the categorisation of heat demand can be found in Figure 7. Further details of the key heat demands for buildings potentially required to connect in the IZO are provided in Table 3**.**

Figure 7: City Centre - Categorisation of Heat Demand for Buildings Required to Connect in Central Area IZO

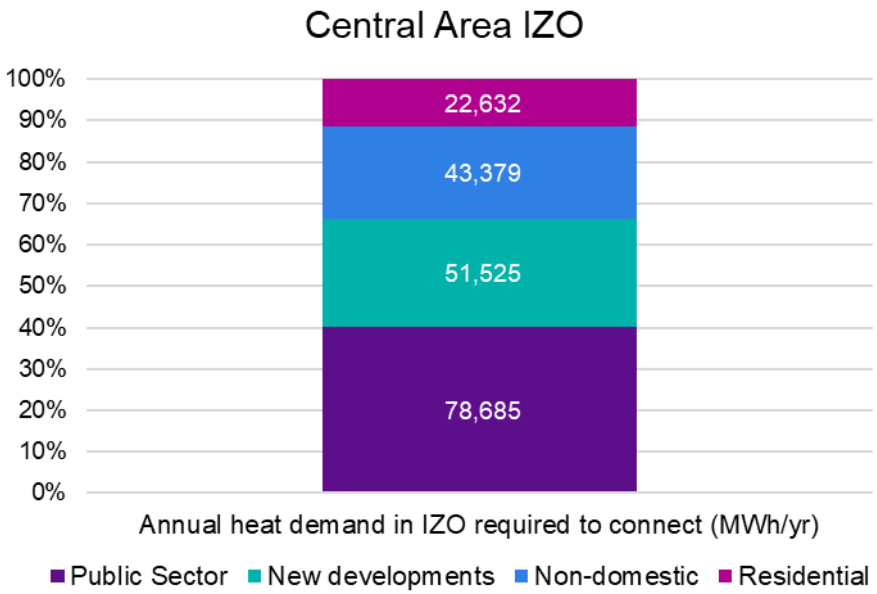


Table 3: City Centre - Key Heat Demands Required to Connect in the Central Area IZO[6]

Building name	Building category	Number of connections	Annual heat demand (MWh)	Data source
St James's University Hospital	Public sector	Unknown	41,000	ERIC
Leeds General Infirmary	Public sector	Unknown	33,000	ERIC
Kirkstall Road Development	New development	Unknown	10,900	Pilot Methodology
Wellington Place development	New development	Unknown	9,950	Pilot Methodology
Appleton Way	Residential	Unknown	8,300	Benchmark (NZM)
First Direct Arena	Non-domestic	1	6,000	Benchmark (NZM)
Leeds Dental Institute	Non-domestic	1	3,750	Benchmark (NZM)
Trinity Leeds	Non-domestic	Unknown	3,500	Benchmark (NZM)
Leeds Beckett Union Building	Non-domestic	Unknown	3,100	Benchmark (NZM)

The **Skelton Grange IZO** is largely industrial, with 100% of the annual heat demand for the network being non-domestic. The area covers non-residential buildings split across the north and south sides of the River Aire, with large, anticipated industrial heat demands, including Arla Foods, with a total estimated demand of approximately 11GWh/yr across two buildings.

The estimated annual demand for the IZO is approximately 46GWh/yr. A breakdown of the categorisation of heat demand can be found in Figure 8. While there are potentially some limitations in the diversity of this network's demand profile, the absence of any new developments provides high confidence in the baseline. Further details of the key heat demands for buildings potentially required to connect in the IZO are provided in Table 4.

[6] Please refer to Appendix 3 for definitions related to building categories in this table.

Figure 8: City Centre – Categorisation of Heat Demand for Buildings Required to Connect in Skelton Grange IZO

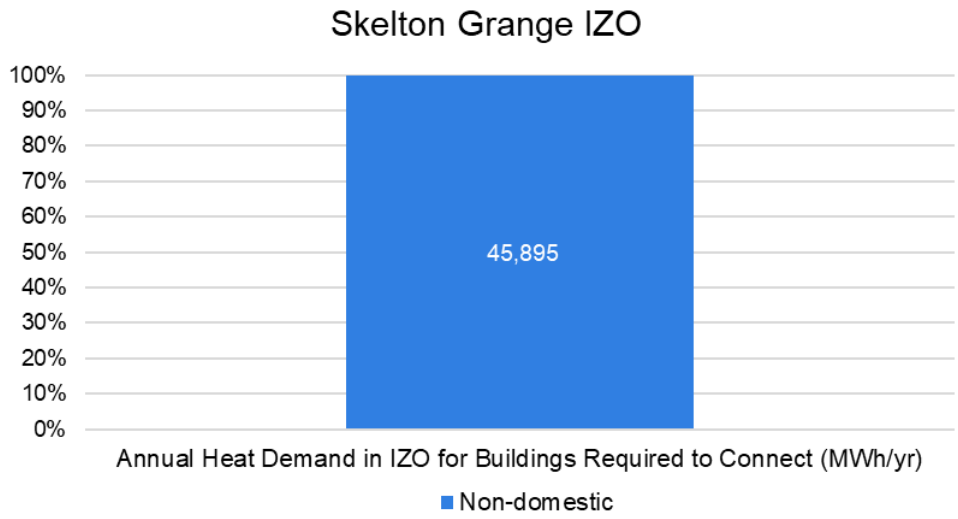


Table 4: City Centre – Key Heat Demands Required to Connect in the Skelton Grange IZO[7]

Building name	Building category	Number of connections	Annual heat demand (MWh)	Data source
Arla Foods	Non-domestic	1	10,800	Benchmark (NZM)
Kloeckner Metals	Non-domestic	1	10,200	Benchmark (NZM)
Verallia UK	Non-domestic	1	5,750	Benchmark (NZM)
Bright Horizons	Non-domestic	1	2,900	Benchmark (NZM)
Scientific Games	Non-domestic	1	2,700	Benchmark (NZM)
Batley's Wholesale	Non-domestic	1	2,050	Benchmark (NZM)
ML Logistics	Non-domestic	1	1,950	Benchmark (NZM)
Orange Clearance	Non-domestic	1	1,200	Benchmark (NZM)

Within the **South Bank IZO**, high-density residential development is planned around Holbeck Urban Village over the next decade which will significantly increase the existing heat demand.

[7] Please refer to Appendix 3 for definitions related to building categories in this table.

Correspondingly, almost 50% of the estimated heat demand for this IZO is associated with new residential and mixed-use developments. Within the existing loads, there are a mixture of industrial units, office spaces and public sector buildings, including the Royal Armouries with an estimate annual heat demand of around 2GWh/yr.

The current estimated annual demand is approximately 84GWh/yr. A breakdown of the categorisation of heat demand can be found in Figure 9. Overall, the South Bank network offers a diverse and resilient demand, with a balance between existing buildings and new residential developments. Further details of the key heat demands for buildings potentially required to connect in the IZO are provided in Table 5.

Figure 9: City Centre - Categorisation of Heat Demand for Buildings Required to Connect in South Bank IZO

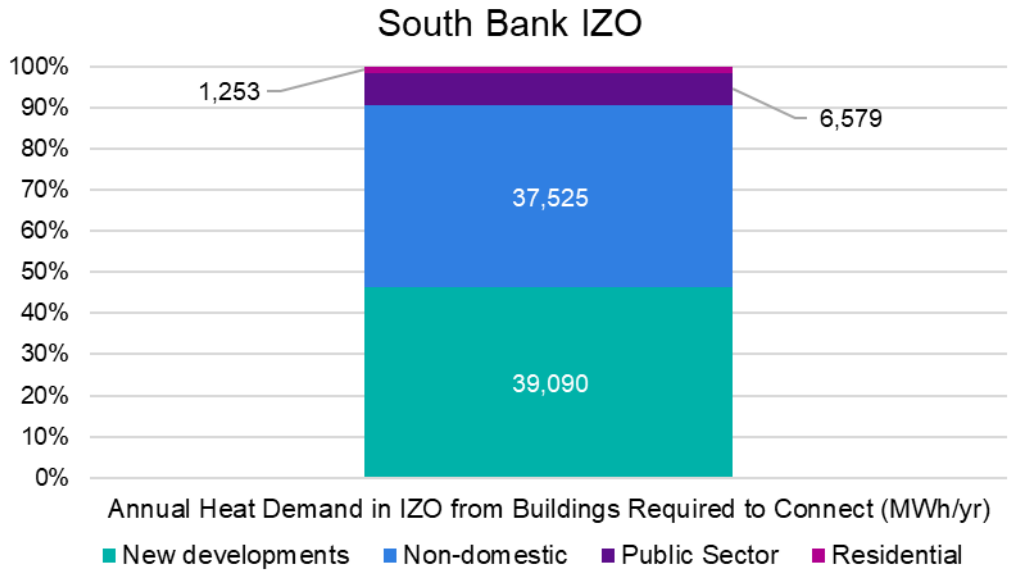


Table 5: City Centre - Key Heat Demands Required to Connect in the South Bank IZO[8]

Building name	Building category	Number of connections	Annual heat demand (MWh)	Data source
Dewsbury Road development	New development	Unknown	6,900	Pilot Methodology
Temple Works development	New development	Unknown	6,050	Pilot Methodology
Monksbridge development	New development	Unknown	5,300	Pilot Methodology
Manor Mills development	New development	Unknown	4,100	Pilot Methodology

[8] Please refer to Appendix 3 for definitions related to building categories in this table.

Building name	Building category	Number of connections	Annual heat demand (MWh)	Data source
Schneider Electric	Non-domestic	1	3,650	Benchmark (NZM)
Globe Road development	New development	Unknown	3,550	Pilot Methodology
St David's Court development	New development	Unknown	2,750	Pilot Methodology
Temple Leeds development	New development	Unknown	2,500	Pilot Methodology
Royal Armouries	Public sector	1	1,950	Benchmark (NZM)

3.1.5) City Centre – IZO Heat Sources

Table 6 and Table 7 summarise the key heat sources and potential energy centre locations identified for the three IZOs. These are also shown in the zone-level map in Figure 6 in Section 3.1.3 above and in Appendix 1 Map C.

Central Area IZO - The Leeds RERF is the primary heat source proposed to supply the Central Area IZO. The RERF currently supplies the existing Leeds PIPES network and has an estimated peak capacity of 20MW_{th}.

Skelton Grange IZO - The Enfinium EfW is the proposed heat source for the Skelton Grange IZO. The estimated heat capacity of this plant is 49MW_{th}, well above the projected 13MW peak demand of the IZO. There are also potential opportunities for ground, river water, or mine water extraction in the area, but these are subject to further technical appraisal.

South Bank IZO - Three potential low-carbon heat sources have been identified within the South Bank area. There are two sources of industrial waste heat, Verallia glass manufacturing plant and AQL data centre with an estimated 12.5MW and 2.5MW peak output respectively. There is also the potential opportunity for heat recovery via a WSHP at the River Aire, with an estimated capacity of 20MW. This is subject to further feasibility and technical assessment.

Table 6: City Centre - Key Heat Source Opportunities for the IZOs

Heat source type	Capacity (kWp)	Temperature (ºC)	Potential energy centre location
EfW			
Cross Green RERF	20,000	90 ºC (assumed)	Existing Leeds PIPES energy centre – E1
Skelton Grange EfW	49,000	90 ºC (assumed)	Adjacent to Enfinium EfW in Skelton Grange – E2
Waste heat (with heat pumps)			
Verallia Glass	4,000	75 ºC (high) 35 ºC (low)	Adjacent to glass manufacturing plant – E3
Datacentre - AQL	1,250	28 ºC (assumed)	Substation connection by datacentre, with central energy centre at Verallia Glass
WSHP			
River Aire	9,500	6ºC (winter, assumed)	South Bank area, beneath Victoria Bridge

The capacity shown in Table 6 is the estimated 'full opportunity capacity' of the heat sources, i.e. the heat available pre-heat pump.

Location-agnostic heat sources such as air source heat pumps are not included in Table 6 as they are a solution that could be used as a 'fall-back' or 'top-up' supply option to meet any remaining heat requirements.

Table 7: City Centre - Potential IZO Energy Centre Locations

EC ref number	Site type	Size (m^2)	Ownership	Heat source
E1	Building	13,000	LCC	EfW
E2	Land	32,000	SSE	EfW
E3	Land	2,000	Unknown	Industrial Waste Heat

3.1.6) City Centre – IZO Heat Distribution

The approach to developing the heat network route considered economic viability, investment scale and returns, decarbonisation impact and deliverability. These criteria were applied in a standardised manner across all opportunities identified in the Pilot programme and therefore may not reflect detailed designs or proposed routes identified in more detailed feasibility work. Routing within the site boundary of a building or campus may not have been included if insufficient information was available. The IZO routing was developed solely around buildings which could be required to connect and did not consider potential voluntary connections.

The purpose of the concept heat network route is to define the scale, potential routing and identified associated constraints within the zone. Further work will be required to undertake a more detailed route assessment to take account of the buried utilities, building connections and other local strategic and local planning considerations. Table 8 shows the network statistics for the IZOs including the network length and associated cost. Please see Appendix 5 for related methodology statements and assumptions.

Central Area IZO - For the Central Area opportunity, it is expected that the existing RERF and Cross Green Energy Centre would be expanded to accommodate the additional load. The IZO network reflects the Leeds PIPES routing, working west from the RERF into Leeds City Centre, where it has branches north to supply St James's University Hospital and First Direct Arena, and south to supply Leeds Train Station. The IZO network crosses the River Aire via Wellington Bridge to supply areas of development around Castleton Industrial Estate.

Skelton Grange IZO - For the Skelton Grange opportunity, it is expected that the energy centre would be located close to the Enfinium EfW plant. From there, the IZO network branches north to supply Knostrop Wastewater Treatment Works, and south to reach other industrial loads, crossing the River Aire via Skelton Grange Road bridge. In the industrial area south of the Aire, the network branches south-east to supply Arla Foods and Leeds Valley Park, with a separate leg routing north via Pontefract Road to supply more commercial and industrial properties, including Bright Horizons.

South Bank IZO - For the South Bank opportunity, it is expected that the energy centre would be close to the Verallia glass manufacturing plant. From there, the network extends across the wider South Bank area, bound by the M621 to the south, A61 to the east, principal railway lines to the west.

Table 8: City Centre - Indicative Heat Network Statistics for IZOs

IZO description	Network length (km)	Network cost (£m)
Central Area	58.5	37
Skelton Grange	10.0	25
South Bank	31.7	127

3.1.7) City Centre – IZO Key Constraints and Mitigations

Central Area IZO:

[C1 & C2] Rail crossing: Principal railway lines laterally bisecting the zone are the primary constraint associated with transport services, with a total of two rail crossings in the proposed IZO routing. Mitigations could include re-utilising existing ways made for the Leeds PIPES network, as the network also crosses the principal railway lines to the east of the city.

[C3] River crossing: The River Aire runs through the city centre, with one crossing in the proposed IZO routing. As part of the future planning for the Leeds PIPES network, LCC have already installed a pipe in Citu Bridge which could facilitate this crossing (and support South Bank interconnection). There are additional bridges available in the area (Wellington, Monksbridge, Monk) that could also offer technically feasible crossing points.

Skelton Grange IZO:

[C4] River crossing: Crossing the River Aire is essential in the proposed IZO routing, as it connects the EfW plant to the areas of industrial and commercial demand. Routing is proposed via the Skelton Grange Road bridge, but if this is technically infeasible it may be necessary to route a heat main via the Aire Valley Viaduct to the south of the EfW plant.

[C5] Rail crossing: There is one rail crossing (of the Hallam line) in the proposed IZO routing. Mitigations could include routing via the Pontefract or Wakefield Road Bridges.

South Bank IZO:

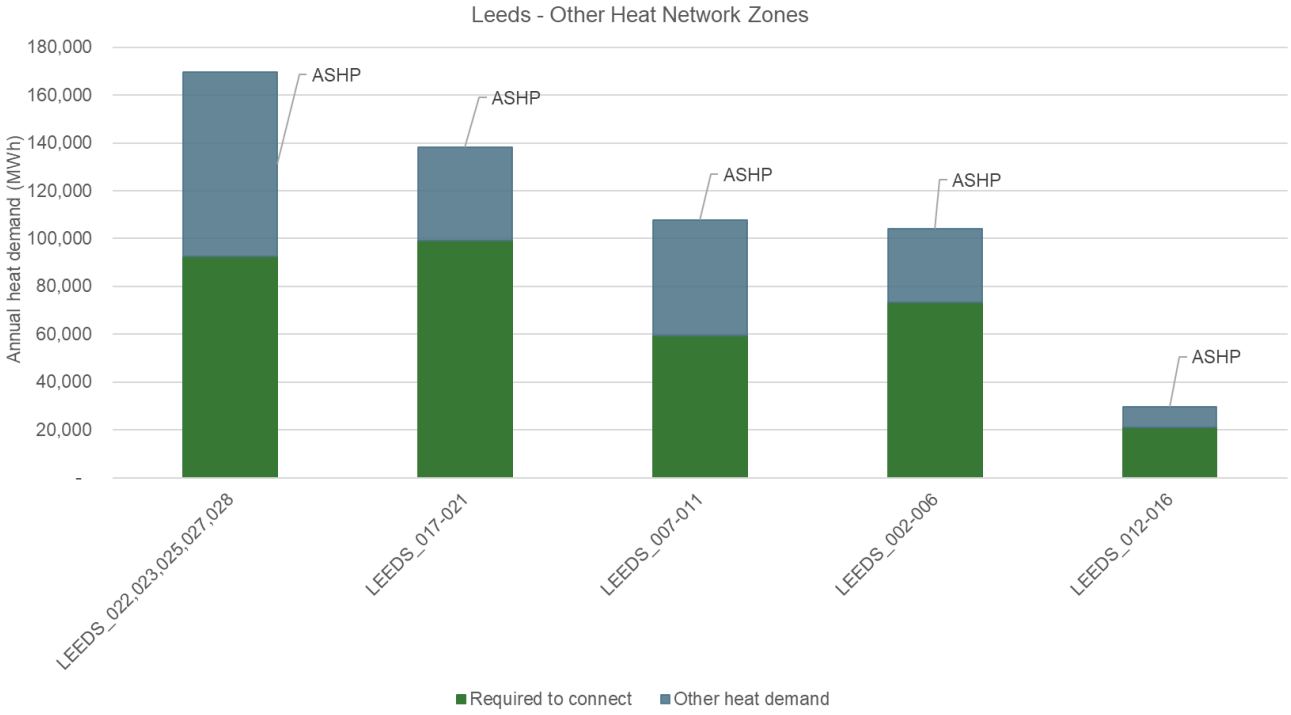
There are no major constraints for the proposed South Bank IZO network route.

4) Other Heat Network Zones

This section describes the 'Other' potential heat network zones that were identified in Leeds. These are areas where heat networks were deemed to offer the lowest carbon route to decarbonising heat but are often much smaller or discrete in nature than the 'Strategic' heat network zones identified. The approach taken in the Pilot programme did not apply a minimum threshold for zone identification and therefore future work will need to consider factors such as size and aggregation to ensure efficient and effective delivery of heat networks in the area.

Figure 10 illustrates the total annual heat demand, and the proportion of which is associated with buildings that may be required to connect within each zone. Where potential heat sources have been identified these are labelled against each bar. A map of all zones can be found in Figure 4.

Figure 10: Total Heat Demand and Proportion Required to Connect in Other HNZs



LEEDS_002-006: are situated in the northern part of the local authority. LEEDS_002 and 003 are within Otley, covering the town centre and Wharfedale Hospital areas respectively. LEEDS_004 includes the retail and industrial park surrounding Sandbeck Lane in Wetherby, with LEEDS_005 covering similar buildings to the south-east in Thorpe Arch estate. LEEDS_006 is within Yeadon and covers the Westfield Industrial Estate and town centre.

LEEDS_007-011: lie north and west of the city centre. LEEDS_007 is in the southern part of Yeadon, in an area with both existing non-domestic loads and planned residential development. LEEDS_008 is centred around Ralph Thoresby School in Cookridge and includes surrounding leisure facilities and planned developments. LEEDS_009 is a zone

covering Leeds Trinity University campus. LEEDS_010 is just south of the Trinity campus in Horsforth and includes several schools and retail properties in proximity. LEEDS_011 is the largest of these zones and covers a significant proportion of Farsley both north and south of the regional railway line into Leeds. It includes several non-domestic loads in the east in the Grangefield Road Industrial and Pickup Business Parks, as well as areas of planned development to the west and north of the zone.

LEEDS_012-016: are smaller zones surrounding the city of Leeds. LEEDS_012 covers Pudsey Town Centre, in an area of relatively high-density demand including the market, leisure centre, library and health centre. LEEDS_013 is in Bramley, covering the library and St Peter's School in its northern portion, as well as a small retail park just south of these. LEEDS_014 is in Kirkstall and covers the area of planned development around Kirkstall Place, as well as Kirkstall Valley Retail Park adjacent to the River Aire (which could act as a low-carbon heat source in this zone). LEEDS_015 is a dedicated zone around the Leeds Beckett University Headingley campus, and LEEDS_016 is a similar campus-focused zone surrounding Carr Manor Community School.

LEEDS_017-021: lie to the north and east of the city centre, with LEEDS_021 the exception in the southwest. LEEDS_017 and LEEDS_018 are both small zones in Roundhay focused on a few key anchor loads; Allerton Grange School in LEEDS_017 and a combination of Roundhay School and Spire Hospital in LEEDS_018. LEEDS_019 is a large zone which covers the area just west of the A6120, from Whinmoor in the north to Thorpe Park Retail Park in the south. This zone reflects the significant residential development planned in the area, serving key non-domestic loads in proximity, including the Smeaton Academy and Leeds Private Hospital. LEEDS_020 is a smaller zone centred around Seacroft Hospital in Cross Gates, also covering planned developments in the surrounding area. LEEDS_021 is in Farnley and covers several non-domestic demands including the Farnley Academy and Whitehall Industrial Estate.

LEEDS_022, 023, 025, 027 & 028: are the remaining zones to the south and east of Leeds City Centre (note that during this stage of the analysis LEEDS_024 & 026 have been consolidated into LEEDS_001). LEEDS_022 is a zone dedicated to the Freefield Industrial Estate just north of the Gildersome Interchange, covering both existing non-domestic loads and areas of planned non-domestic development. LEEDS_023 is a larger zone which covers much of Morley, including the town centre and stretching south to include areas of planned development and the Howley Park Industrial Estate. LEEDS_025 is in Middleton, covering an area surrounding Leeds Corinthians Rugby Club which includes Middleton Leisure Centre and new non-domestic development planned on the former St George's Retail Park site. LEEDS_027 is in Garforth, anchored by the Garforth Academy and extending north as far as sheltered housing at Halliday Court. LEEDS_028 covers Kippax Town Centre is focused on retail loads and nearby primary schools in the area.

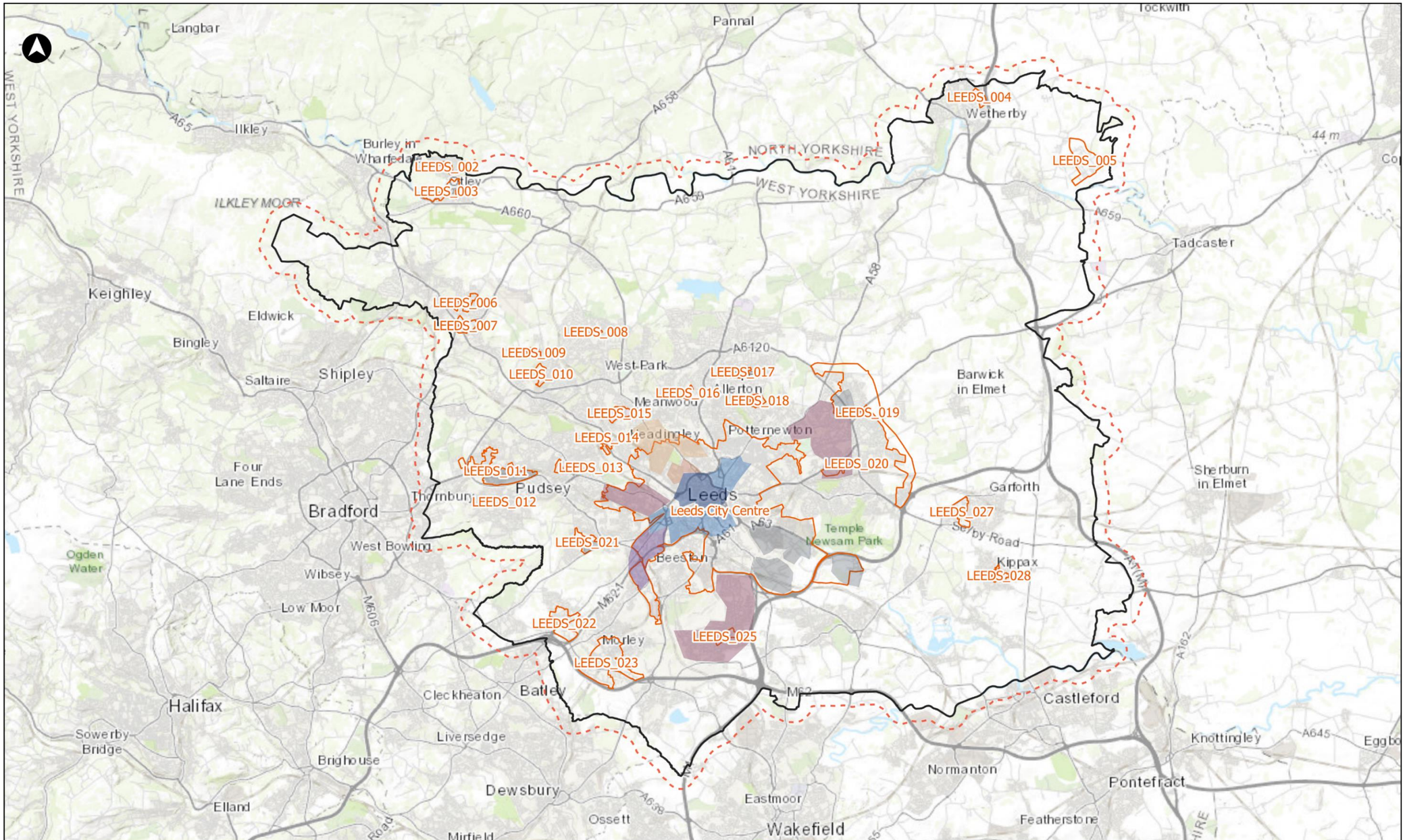
Appendix 1: Maps and Legends

This section provides guidance on interpreting the icons and legends used throughout this report and Maps A-G that follow:

Legend / icon	Relevant map(s)	What this represents on the map	Comments on interpretation
	Report maps	Study boundary	Extends 1km beyond Local Authority boundary to include cross boundary opportunities
	Report maps	Local Authority boundary	
	Report maps	Other Local Authority boundary	
	Report maps	Heat network zones	This includes both Strategic HNZs and Other HNZs.
	Report maps	Other heat network zones	Smaller or discrete heat network zone opportunities
	Report maps	New developments	New development within heat network zones and IZOs that will still be in construction post-2025
Gates Hill	Report maps	Heat network zone name / reference number	‘Strategic’ zones are named; ‘Other’ zones are represented by a reference number
	Report maps	Buildings potentially required to connect	Buildings that could be required to connect (as described in the HNZ Consultation 2023)
	Report maps	Campuses	Multiple buildings owned and operated by the same organisation (e.g. Universities, Hospitals)
	Report maps	Initial Zone Opportunity concept network route	Conceptual heat network pipe routes between buildings that could be required to connect
	Report maps	Existing and Planned Heat Networks	Known existing or planned heat network pipe routes as provided by local stakeholders
	Report maps	Potential energy centre - IZO	Potential energy centre location for an IZO (see section 3)
	Report maps	Existing/planned energy centre - Communal HNs	‘Communal’ energy centres are those operated within a single building or across a campus
	Report maps	Existing/planned energy centre - District HNs	‘District’ energy centres supply multiple buildings across multiple sites
Appendix 1: A – Typology map			
	Appendix 1: Map A	Dense City Centre	Locally recognised as the City or Town centre, where buildings development is most dense
	Appendix 1: Map A	City Centre Fringe	Around the City or Town Centre or at its outskirts, where both building density reduces
	Appendix 1: Map A	Mixed Use District	A variety of building typologies, with no single typology prevailing in the area
	Appendix 1: Map A	Social Housing	Public, private and third sector social housing
	Appendix 1: Map A	Campus (health / education)	Buildings that are owned and operated together (e.g. Universities, Hospitals)

	Appendix 1: Map A	Commercial / business office	Public & private office space
	Appendix 1: Map A	Industrial areas	Primarily used for manufacturing, engineering, and warehousing
Appendix 1: B – Key heat demands			
	Appendix 1: Map B	Top 10 Heat Demands	The largest (anchor) heat loads within the Pilot programme study area (see Section 3)
	Appendix 1: Map B	Local Authority	Buildings owned or operated by the Local Authority
	Appendix 1: Map B	Other public sector	Other buildings owned or operated by the public sector (e.g. hospital, universities, Govt. estates)
	Appendix 1: Map B	Residential with existing communal heating	Residential buildings with existing communal heating systems installed
	Appendix 1: Map B	Non-domestic private	Non-domestic private buildings (e.g. commercial, offices)
	Appendix 1: Map B	Industrial	Mixed industrial sites (e.g. light or heavy industry, manufacturing, warehouses and distribution)
400 - 600	Appendix 1: Map B	Building heat demand (MWh/yr)	Circle size increases with size of heat demand
Appendix 1: C – Key Heat Sources and Potential Energy Centres			
	Appendix 1: Map C	EfW plant	**Point heat sources** have known or likely points of heat offtake/abstraction Mine water and water source ‘points’ indicate potential abstraction points. Other waste heat sources include sewers, electrical substations and other sources of heat. See section 3 for more detail on heat source capacities, where known. On the City-level Map C only, the heat waste symbol is sized according to its scale in GWh/yr
	Appendix 1: Map C	Industrial Waste Heat	
	Appendix 1: Map C	Mine water	
	Appendix 1: Map C	Other Waste Heat	
	Appendix 1: Map C	Water Source	
	Appendix 1: Map C	Waste Water Treatment	
	Appendix 1: Map C	Deep geothermal or mine water heat	**Area heat sources** differ from point-heat sources in that the exact location for extracting heat from the resource is not yet determined
	Appendix 1: Map C	Ground source	
	Appendix 1: Map C	Water source	
Appendix 1: D – Existing and planned heat networks			
	Appendix 1: Map D	Existing and planned heat networks	At this scale the route of an existing HN cannot be displayed, so an area outline is used instead
Appendix 1: E – Physical constraints			
	Appendix 1: Map E	Key constraints	Key heat network routing constraints as described in section 3

A. Leeds Typology Map



Boundaries
- Study Boundary
- Local Authority Boundary
- Other Local Authority Boundary
- Heat Network Zones

Key Typologies
- Dense city centre
- City centre fringe
- Mixed use district
- Social housing
- Campus (health/education)
- Commercial / business office district
- Industrial areas

4 0 4
Kilometres
Scale: 1:140,000
Coordinate System: OSGB36 / British National Grid

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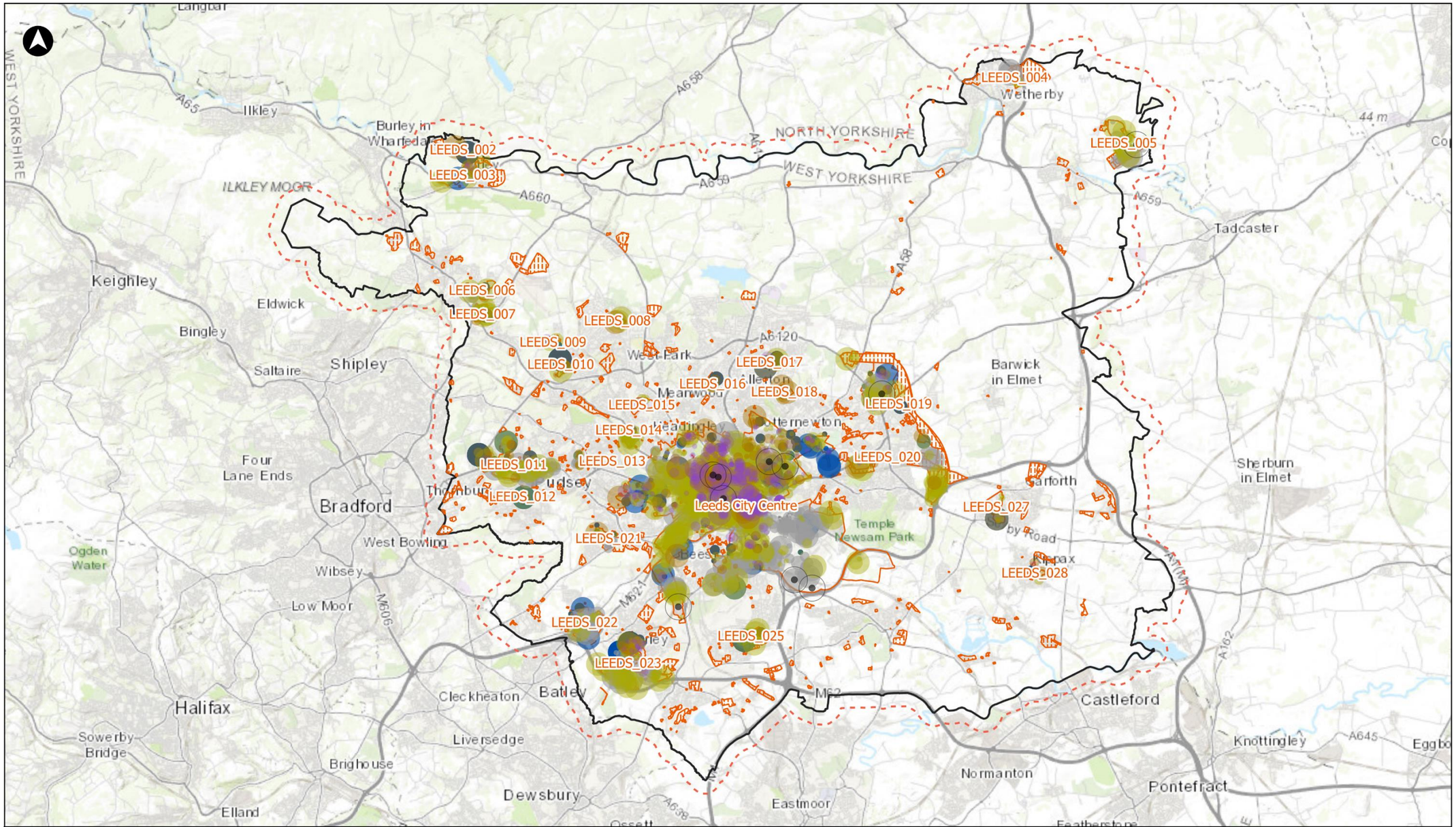
Leeds

Map A

City Typologies

B. Key Heat Demands



Boundaries

- Study Boundary
- Local Authority Boundary
- Other Local Authority Boundary
- Heat Network Zones
- New Development

Key Heat Demand

- Local authority loads
- Other public sector loads
- Residential with communal heating
- Non-domestic private buildings
- Industrial
- Top 10 heat demands

Heat Demand (MWh/Year)

- 100 - 200
- 200 - 400
- 400 - 600
- 600 - 1000+

8 0 8
Kilometres

Scale: 1:140,000

Coordinate System: OSGB36 / British National Grid

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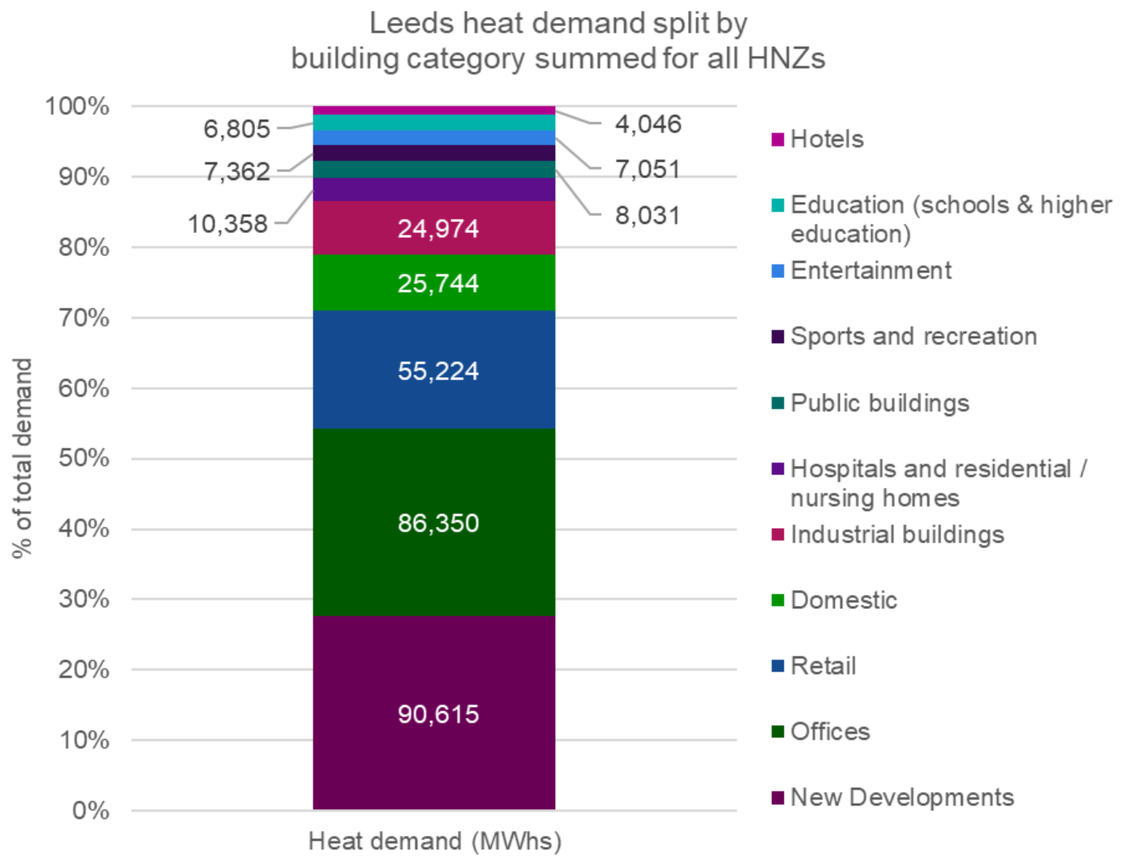
Map B

Key Heat Demand

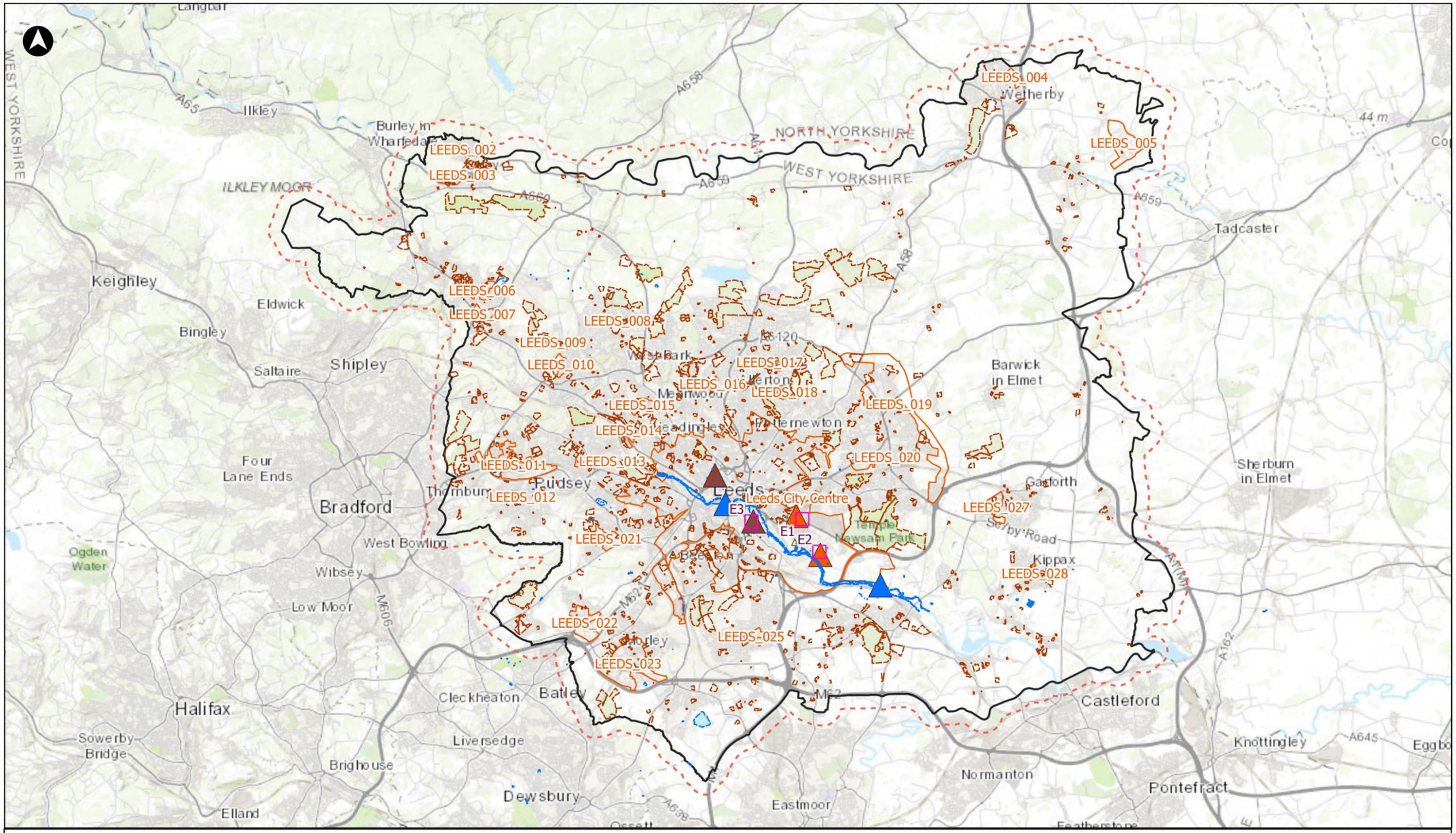
Table 9: Heat Demand split further by Building Categories across all Initial Zone Opportunities identified in Strategic HNZs in the Study Area

Building category	Number of buildings required to connect in this category	Annual heat demand of buildings required to connect across IZOs (MWh)
Domestic	17	25,750
Education (schools & higher education)	9	6,800
Entertainment	22	7,050
Hospitals and residential / nursing homes	3	10,350
Hotels	7	4,050
Industrial buildings	44	24,950
Offices	119	86,350
Public buildings	9	8,050
Retail	69	55,200
Sports and recreation	3	7,350
New Developments	55	90,600
Totals	**357**	**326,550**

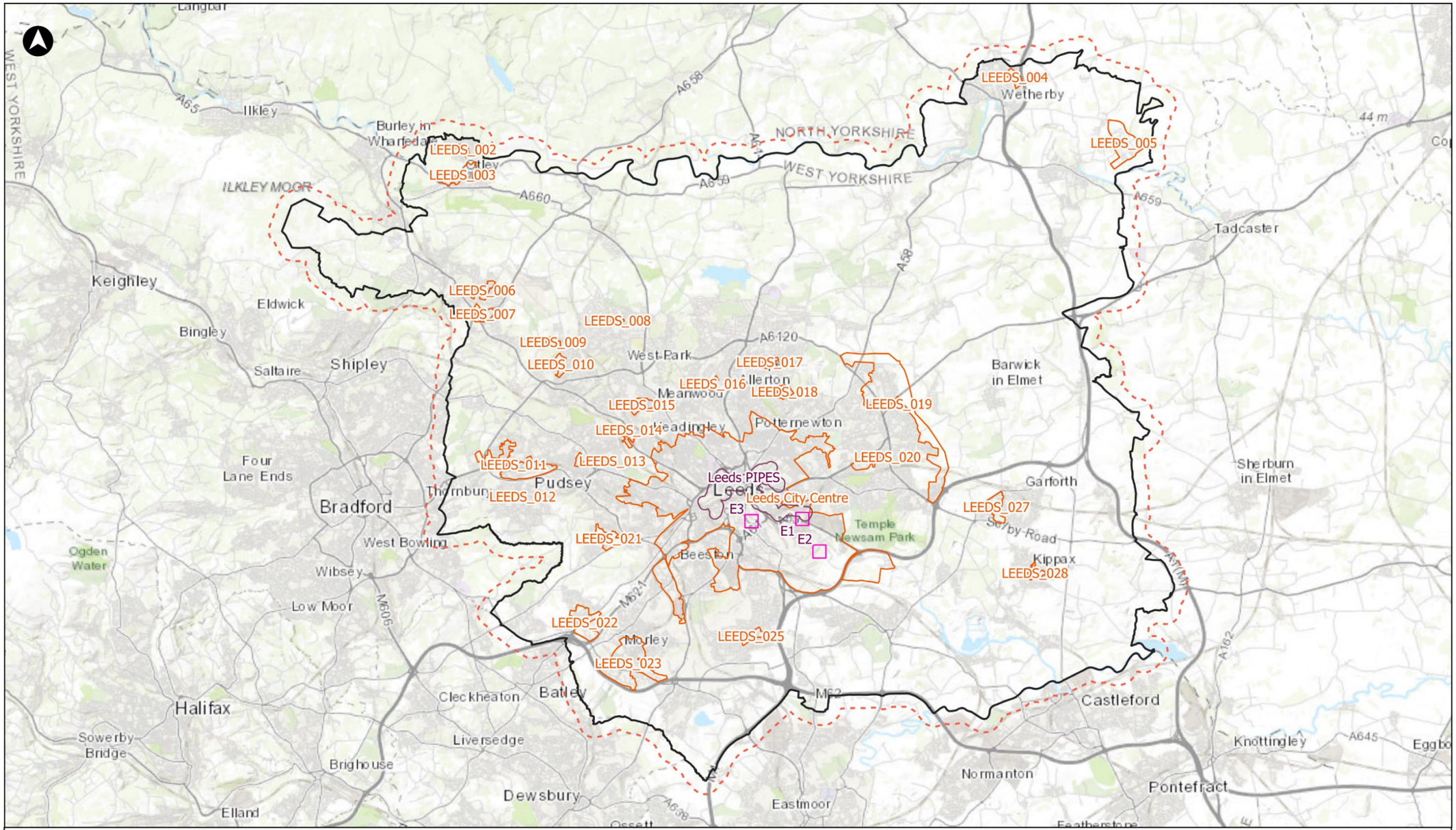


Note: In Leeds there is one Strategic HNZ with three IZOs identified in it. The table and graph above summarise and categorise the heat demand for buildings required to connect to these IZOs.

C. Key Heat Sources and Potential Energy Centres



D. Existing and Planned Heat Networks



Boundaries
- Study Boundary
- Local Authority Boundary
- Other Local Authority Boundary
- Heat Network Zones

Existing and Planned Heat Networks

Energy Centres
- Potential IZO site

8 0 8
Kilometres
Scale: 1:140,000
Coordinate System: OSGB36 / British National Grid

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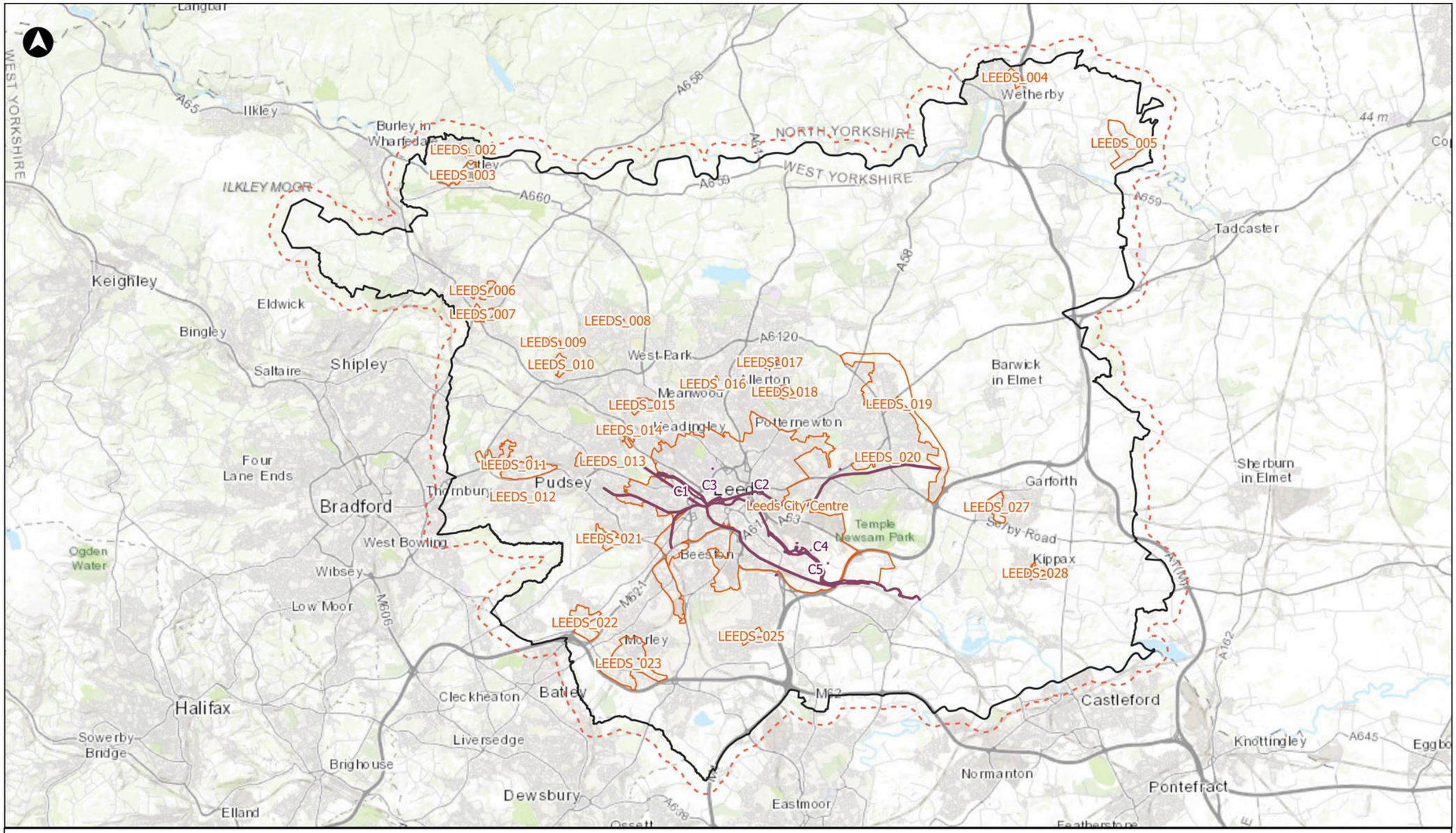
Map D

Existing and Planned Heat Networks

E. Physical Constraints



Boundaries
- Study Boundary
- Local Authority Boundary
- Other Local Authority Boundary
- Heat Network Zones

Key Constraints

8 0 8
Kilometres
Scale: 1:140,000

Coordinate System: OSGB36 / British National Grid

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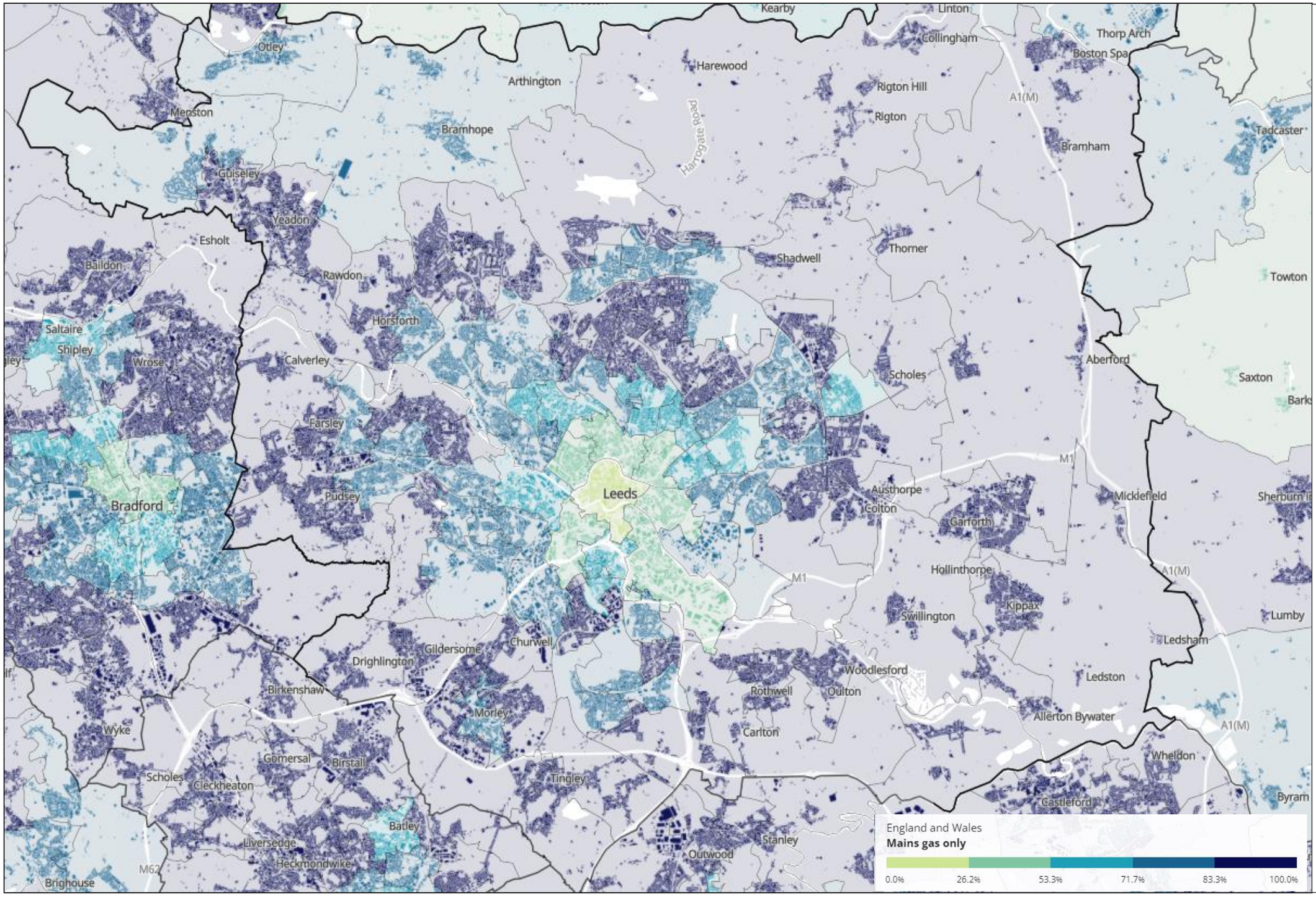
Map E

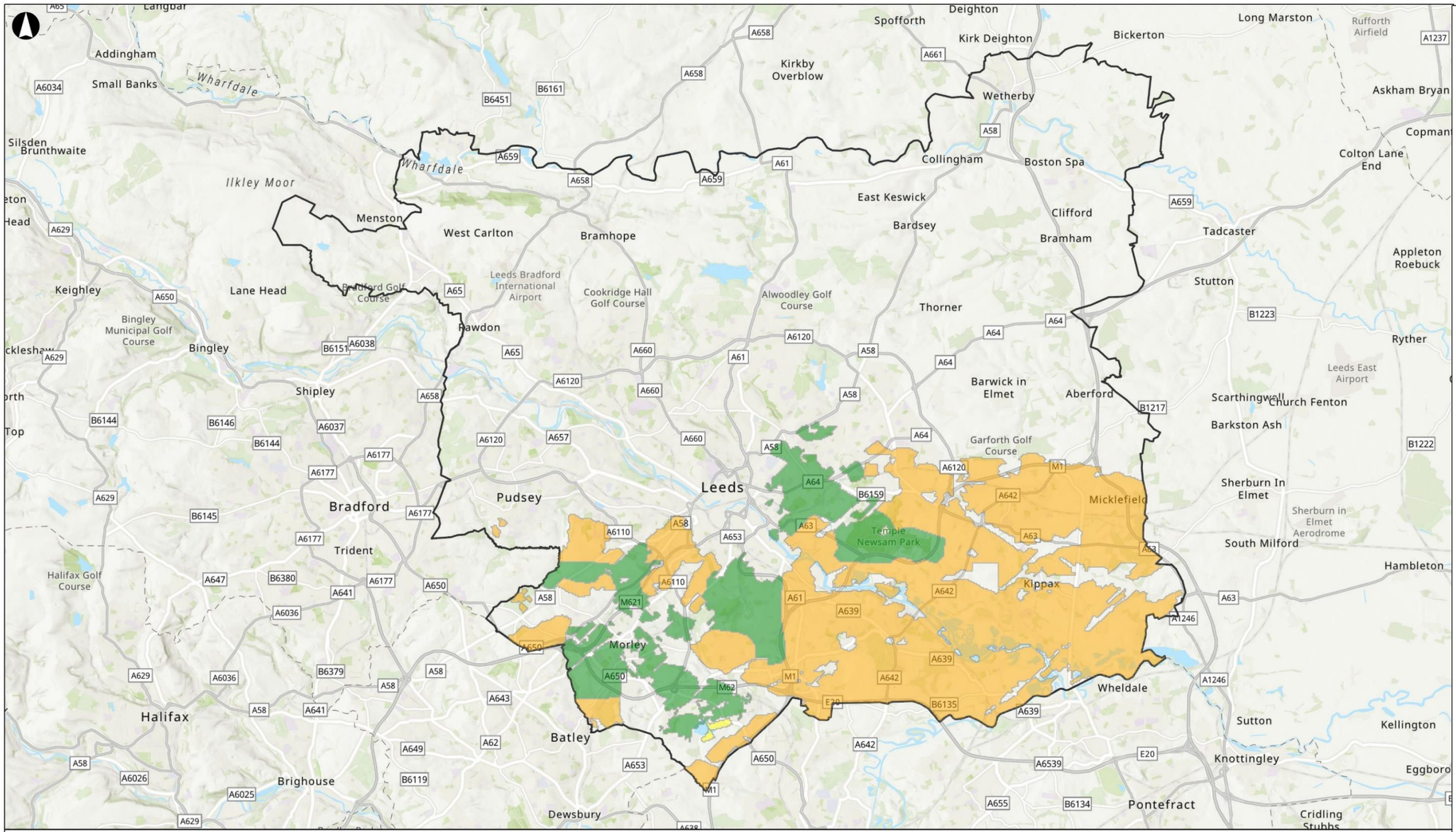
Physical Constraints

F. Off-Gas Grid Areas in Leeds



Credit: This is an excerpt from the ONS Census Maps 2021 which is available to explore online. The data shown is subject to Crown copyright protection, is published under the Open Government Licence (OGL) and embeds map data which is copyright of Ordnance Survey and Street maps.

G. Coal Mine Authority Map



This mine-water heat opportunity map, developed by The Coal Authority, provides an indication of where water from former mine workings could potentially be extracted to provide a source of heat to supply heat networks. The areas of historic coal mine workings within the Local Authority boundary were assessed and a number of factors, such as depth to workings and water levels, were analysed to identify areas of potential opportunity and classified as either 'Good', 'Possible' or 'Challenging'. This opportunity map can be used in combination with plans for heat network projects to identify specific locations where more detailed feasibility studies could be undertaken.

Appendix 2: Data Room Resources

Throughout the delivery of the Pilot programme, information resources have been compiled for future use in relation to the development of heat network zones.

These resources will remain restricted to DESNZ and the local authority. This is to ensure that the department remains within its Data Privacy Notice as shared with stakeholders providing the information. GIS outputs are not being published alongside the report as they are subject to change.

Table 10: Pilot Programme Standardised Information Resources

Information resource	Description of resource
Stakeholder Directory	A directory listing key stakeholders identified and approached during the Pilot programme, including organisation name, address, or website, contact names, work title and contact details.
Stakeholder meetings log and records	A log of key meetings held and related meeting records.
Datasets Directory	A list of datasets / reports shared by stakeholders cross-referencing who provided the item from the stakeholder directory and a description of the dataset.
Geospatial packages and related geo-coded datasets	Geo-coded datasets and descriptions related to maps produced in this report.

Table 11: Pilot Programme Study-Area-Specific Information Resources

Information resource	Description of resource
South Bank DPD Study	DPD study undertaken on behalf of LCC investigating potential for a South Bank heat network

This publication is available from: https://www.gov.uk/government/collections/heat-networks

If you need a version of this document in a more accessible format, please email alt.formats@energysecurity.gov.uk. Please tell us what format you need. It will help us if you say what assistive technology you use.