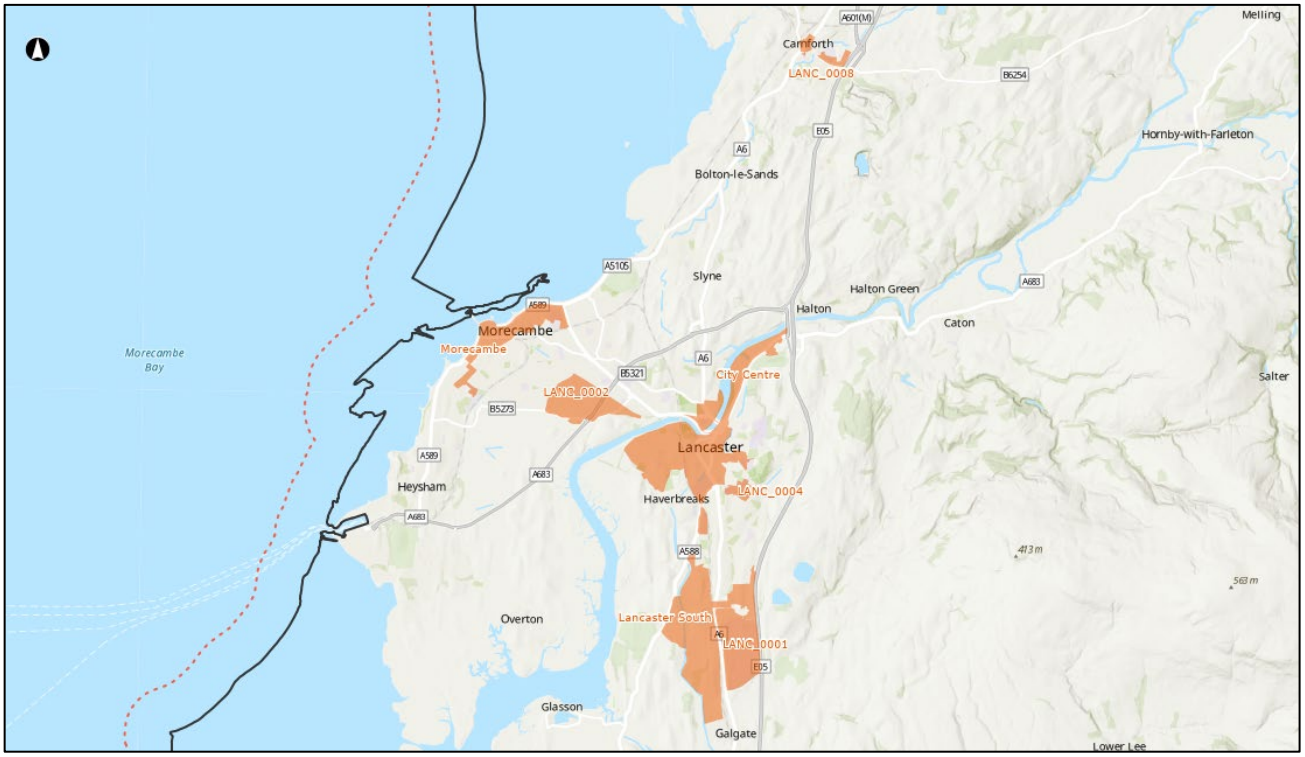
Department for Energy Security & Net Zero

Lancaster

Heat Network Zoning

Zone Opportunity Report



June 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 Lancaster: Lancaster City Council is the local authority for the district which includes Lancaster and Morecambe. The district is part of a two-tier local government system. Lancashire County Council is the upper tier authority.

Local Energy Policy: Lancaster declared a climate emergency in 2019. The council's climate plans include building decarbonisation, local energy, and sustainable transport. The Local Area Energy Plan has a net zero target of 2040.

Existing heat networks: Lancaster has three operational campus heat networks at the University of Lancaster, the University of Cumbria Lancaster Campus, and The Royal Lancaster Infirmary Hospital.

Zones identified: Seven potential heat network zones were identified, with three considered strategic zones. The total annual heat demand for all buildings potentially required to connect within the seven zones is around 175GWh/yr.

Strategic heat network zones: The overall heat demand for all buildings potentially required to connect within strategic zones is around 125GWh/yr.

Key heat demands: The total annual heat demand for buildings connected to the initial zone opportunities identified is 100GWh/yr. Some of the largest buildings include the Royal Lancaster Infirmary Hospital and Standfast & Barracks.

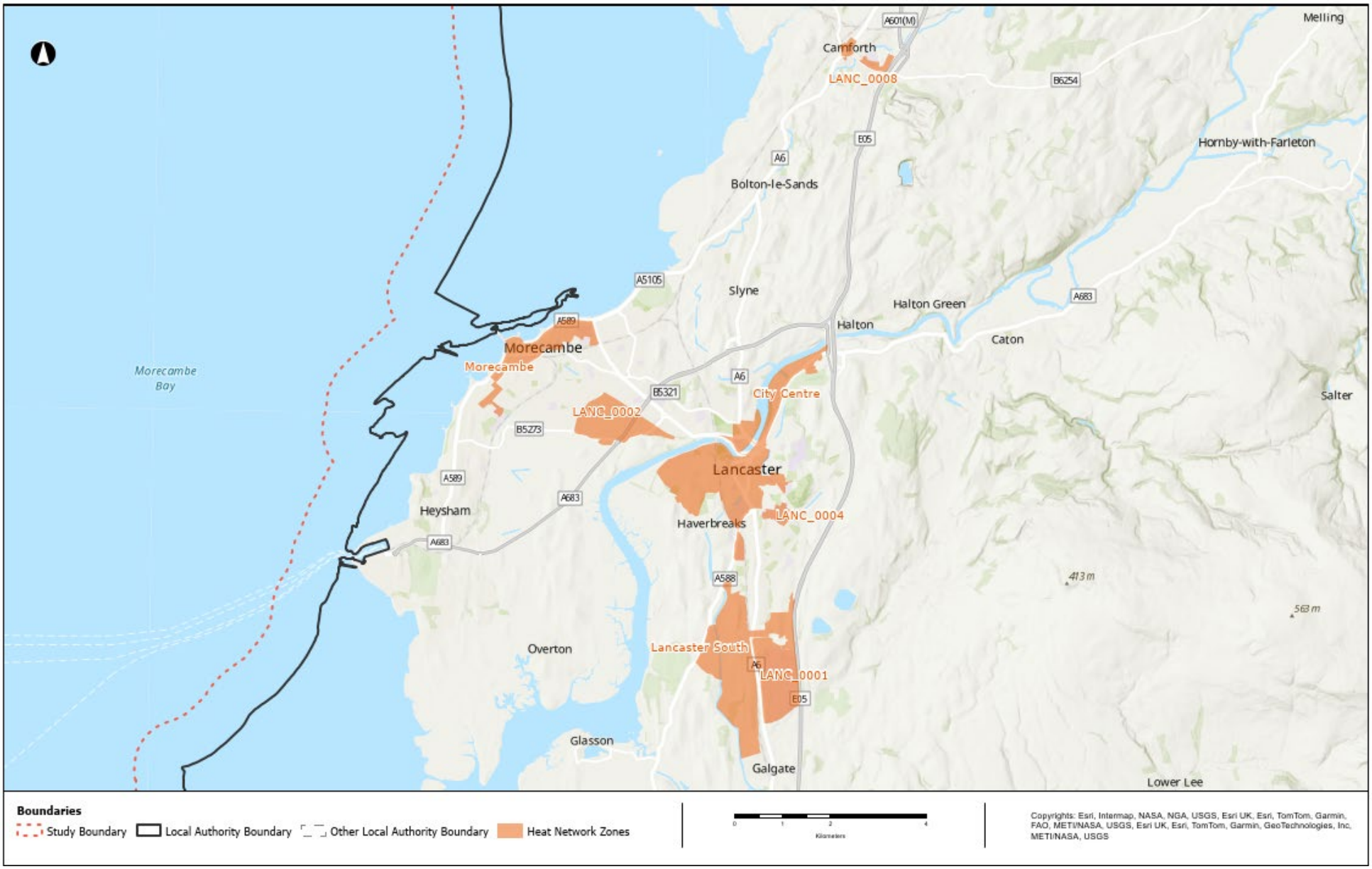
Key heat sources: Potential heat sources include heat recovery from wastewater treatment works and ground source heat pumps.

Estimated CapEx: The estimated capital expenditure for the full rollout of heat networks within identified zones is over £200m, of which the initial zone opportunities amount to approximately £125m.

Other heat network zones: Smaller heat network zones include areas such as the University of Cumbria (which has an existing heat network) and the White Lund Industrial Estate.

Carbon savings: The initial zone opportunities identified could deliver carbon savings of over 14ktCO_{2e} annually.

Figure 1: Overview of Heat Network Zones in Lancaster



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. 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 Lancaster and is intended to showcase potential heat network zones in the district. 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.

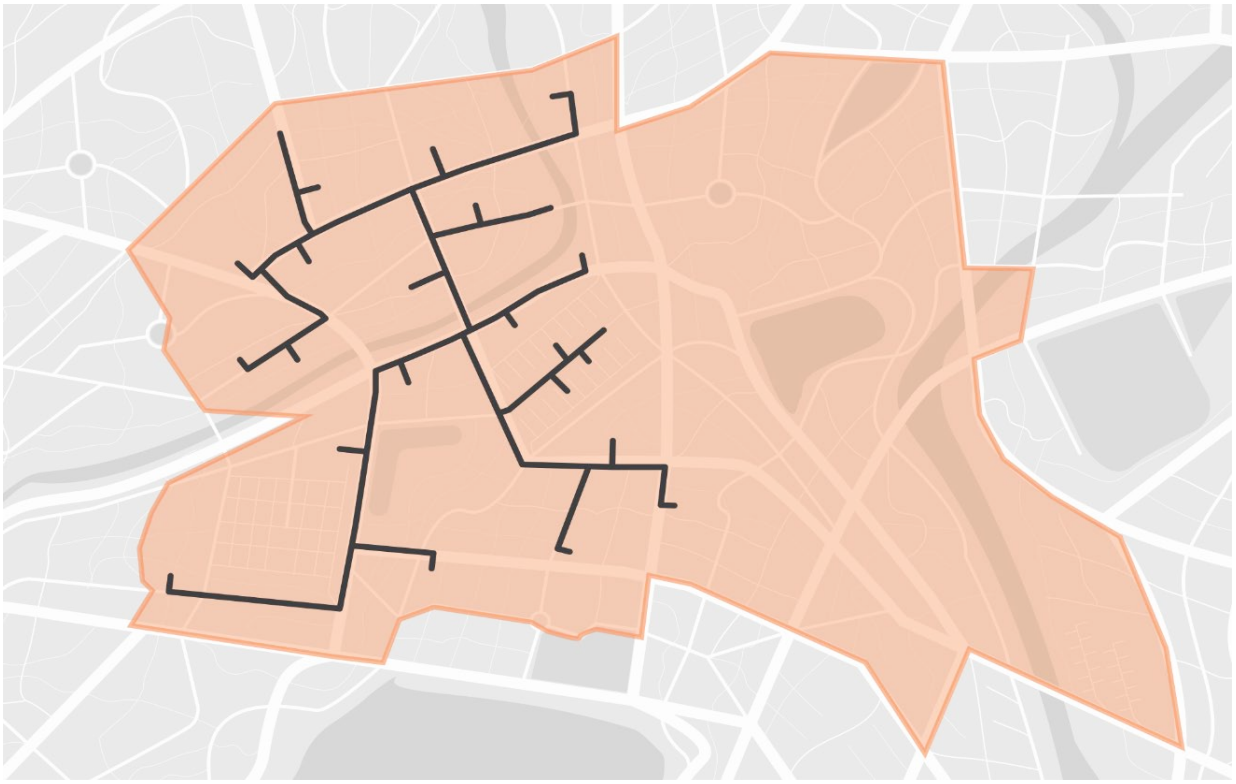
[1] More information can be found in the Heat Network Zoning Methodology Statements (Appendix 3, 4 & 5)

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 potentially 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 potentially 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.

2) Lancaster Heat Networks Context

2.1) Lancaster City Overview

Lancaster City Council (LCC) is a non-metropolitan district in Lancashire County. It includes the City of Lancaster, the core urban area, and includes the towns of Morecambe, Heysham, and Carnforth, and a number of villages.

As of 2021, Lancaster's population stands at around 143,000[3], with a relatively low population density of 1.8 people per ha. Lancaster City is the core urban area, including the towns of Morecambe, Heysham, Carnforth, and several villages. Lancaster comprises a diverse mix of housing, given its history as a port and trader. The economy is now centred on its largest sectors: tertiary education, healthcare, and energy. It has large conservation areas as well as expecting significant areas of new development.

Lancaster has a mix of social, affordable and private housing, with 10% social and affordable housing, 22% private rented and 68% of households owner occupied. It also has notable geographic and topological characteristics, including the medieval centre featuring cobbled streets, landmarks like Lancaster Castle, and the tidal River Lune.

2.2) Lancaster Net Zero Targets and Commitments

In January 2019, LCC declared a climate emergency in response to escalating concerns about climate change. LCC have set a target to reduce the Council's direct emissions to net zero by 2030. LCC published its first carbon zero action plan in 2019, focusing on developing renewable energy schemes as well as fleet and building decarbonisation. The Climate Emergency Local Plan Review was adopted in January 2025 and includes policy for heat networks. Sustainability is the first pillar of the Council Plan (2024-2027) providing further alignment with its climate ambition.

LCC remains the leading district in the UK for actions towards net zero primarily due to its sustainable planning and land use[4]. This includes Lancaster's Salt Ayre decarbonisation project, which was awarded the Association for Public Service Excellence for Best Decarbonisation Initiative. Other notable projects include Burrow Beck Solar Farm, Williamson Park decarbonisation plans, moving from gas boilers to air source heat pumps and a focus on increasing electric vehicle accessibility. LCC is committed to working with others including residents and businesses to achieve aligned targets.

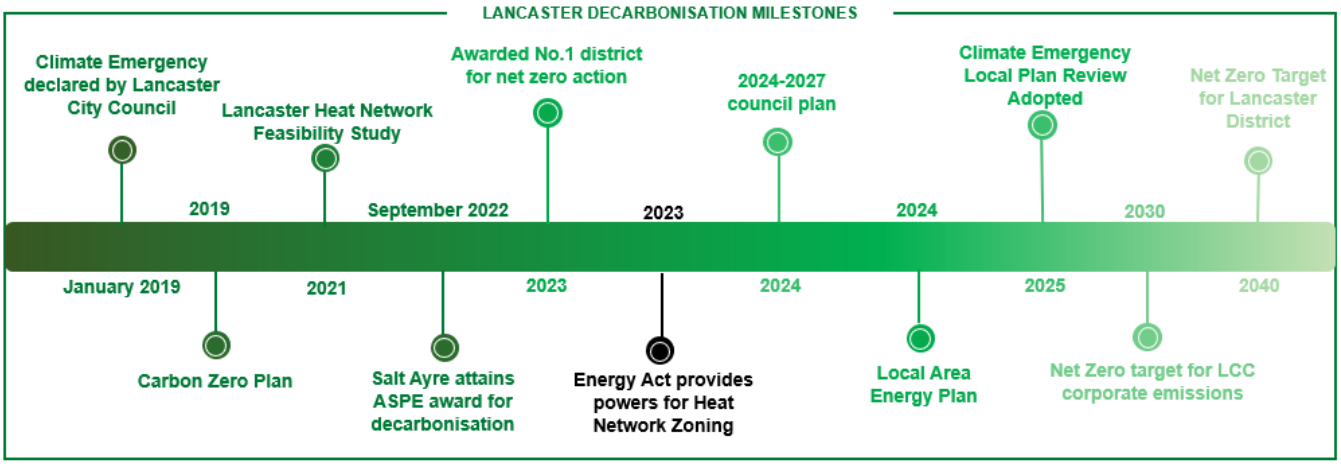
In 2019, the Department for Business for Energy and Industrial Strategy (now DESNZ) commissioned a heat mapping study which identified eight different heat network clusters

[3] Office for National Statistics (2022) How the population changed in Lancaster, ONS. Available at: https://www.ons.gov.uk/visualisations/censuspopulationchange/E07000121/
[4] Climate Emergency UK (2023) Planning & Land Use Lancaster, Council Climate Scorecards. Available at: https://www.councilclimatescorecards.uk/sections/s3_p_lu/?council=lancaster-city-council#questions

across the district. Following this the council commissioned a heat network feasibility study in 2021[5] and a building energy decarbonisation plan in 2022 which aims to reduce the council's direct emissions by 2030. The plan refers to heat networks as an opportunity to increase low-carbon heat, including heat pump installation and fabric improvements. This is further supported by the Local Area Energy Plan (LAEP) for Lancaster, published in 2024[6].

Figure 3, below, summarises key dates in LCC's plans for decarbonisation and demonstrates their progress towards decarbonisation targets announced.

Figure 3: Lancaster Decarbonisation Milestones



2.3) Delivering Heat Networks in Lancaster

Existing heat networks in the Lancaster area include the University of Lancaster, the University of Cumbria Lancaster Campus, and The Royal Lancaster Infirmary Hospital, as well as a largely domestic communally run district heat network.

Currently, the University of Lancaster is undergoing a heat network upgrade to provide a 45GWh/yr of low-carbon heat network, with power supplied by a 11.5MW solar farm and a 2.3MW wind turbine. Vital Energi is working with the university to deliver the heat network alongside a new energy centre, which will generate 95% of the heat for the buildings on campus[7].The Heat Network Efficiency Scheme (HNES) and the Green Heat Network Fund (GNHF) have granted funding to support the network's refurbishment.

The University of Cumbria has an operational district heat network supplying multiple buildings on campus. It is served from a boiler house on campus with two gas boilers. Individual gas

[5] Lancaster City Council (2021) Heat Networks Feasibility. Available at: https://committeeadmin.lancaster.gov.uk/documents/s80614/Heat%20Networks%20Feasibility%20Oct%202021%20Cabinet.pdf
[6] https://www.lancaster.gov.uk/laep
[7] Lancaster University (2024) https://www.lancaster.ac.uk/facilities/estates/net-zero-energy-project/ Lancaster University (2024) Net Zero Energy Project https://www.lancaster.ac.uk/facilities/estates/net-zero-energy-project/

boilers also serve the majority of the other buildings which aren't connected to the heat network.

The Royal Lancaster Infirmary has an operational heat network. A new energy centre was constructed containing three new boilers, and a new CHP unit was installed in 2020[8]. Steam produced from the energy centre is distributed across the hospital campus.

Lancaster Cohousing owns and operates a district heat network serving 41 homes, community buildings and Halton Mill. Solar Thermal and a 151kW wood chip boiler are used to provide heat to the network[9].

LCC has previously undertaken Heat Networks Delivery Unit (HNDU) funded feasibility studies regarding heat networks around redevelopment areas, including exploring the Mainway, Canal Quarter, and new developments in Lancaster South Broad Location for Growth. These proposals remain at the concept stage.

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

2.4) Lancaster Heat Network Zones

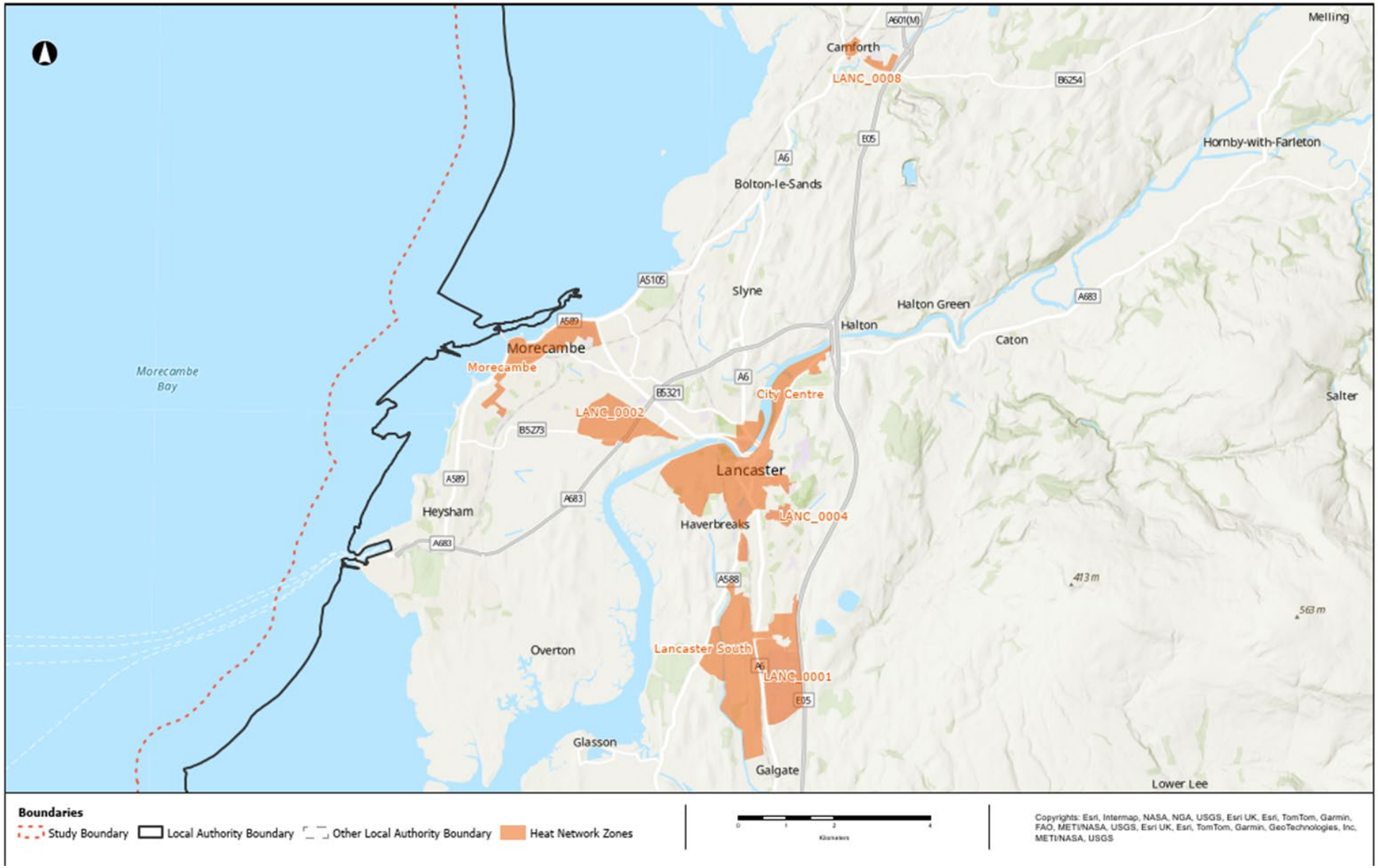
A total of seven potential HNZs were identified in Lancaster, with three considered Strategic HNZs. Figure 4, below, shows the study area boundary as well as the boundaries of all HNZs identified within Lancaster. Strategic HNZs have been allocated a meaningful name agreed as relevant from a local perspective 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 potentially 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 HNs and planned extensions to them as well as any planned HNs in advanced stages of development
- E: Key Constraints Map – Shows key topographical constraints identified
- F: Off Gas Grid – presents areas with differing levels of properties off the gas grid within the study area.

[8] Lancaster Guardian (2024) https://www.lancasterguardian.co.uk/news/national/lancaster-hospitals-new-state-of-the-art-energy-centre-wins-award-for-excellence-4555748
[9] Halton Mill (2025) https://www.haltonmill.org.uk/

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



3) Strategic Heat Network Zones

Strategic HNZs in Lancaster

This section examines the three strategic HNZs and the IZOs identified within each. This covers the key heat demands, heat sources, energy centre locations and potential constraints for each IZO identified. 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 Lancaster. 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 within zones[10]	175
All buildings within strategic zones	125
All buildings connected to the IZOs	100

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 three strategic zones are summarised below. Figure 5 illustrates the size of each, alongside the key potential heat source and the proportion of buildings that may be potentially required to connect.

Lancaster City Centre comprises the commercial and historic city centre of Lancaster. The zone includes the current Royal Lancaster Infirmary Hospital site, which is to be redeveloped,

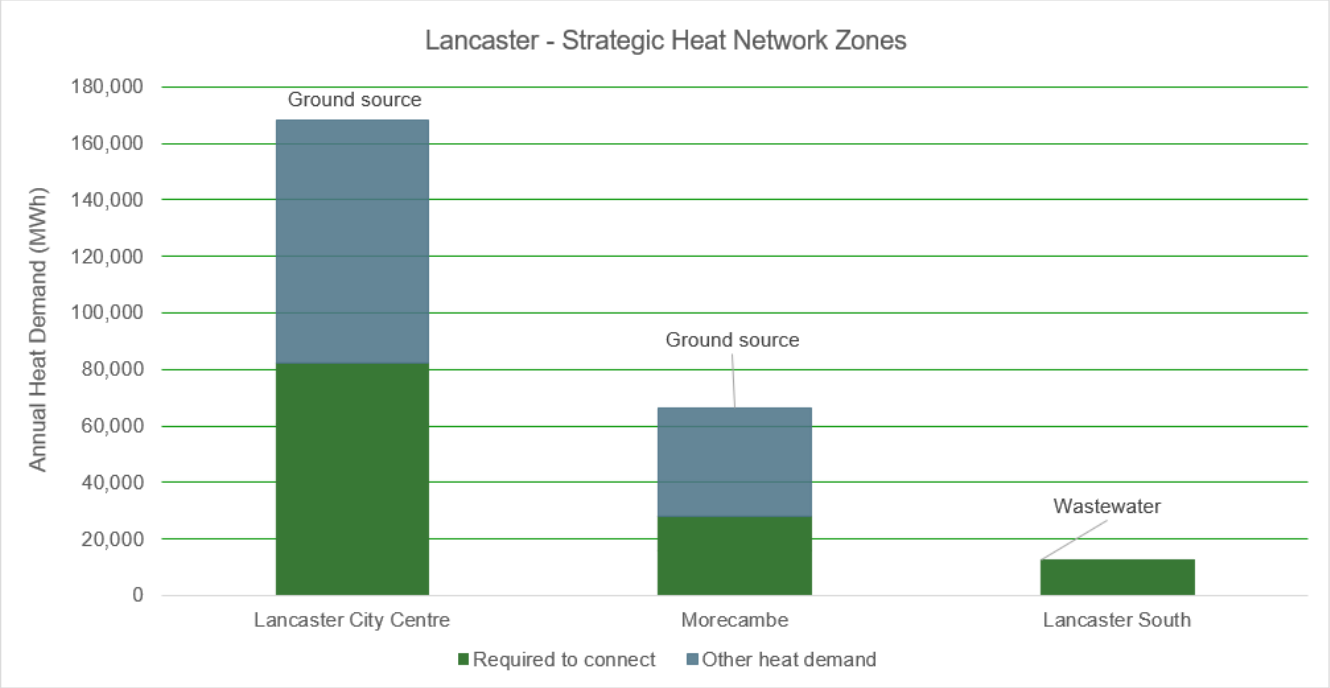
[10] Row 1 is an estimate of heat demand across buildings potentially required to connect in all zones identified. Row 2 is as per row 1, but only within strategic zones. Row 3 includes buildings connected to the IZOs described and largely comprise of buildings potentially required to connect. Figures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

as well as other public and non-domestic buildings. For more information, please see Section 3.1.

Morecambe comprises the commercial centre of Morecambe. It includes large retail buildings such as a Homebase and Morrisons as well as public, non-domestic and council-owned buildings. For more information, please see Section 3.2.

Lancaster South comprises new development areas. The key heat sources include potential heat recovery at the wastewater treatment works in Stodday, located less than 1km from the zone boundary. For more information, please see Section 3.3.

Figure 5: Summary of Heat Demands in all Strategic HNZs Identified



3.1) Lancaster City Centre

3.1.1) Lancaster City Centre – HNZ Summary

Lancaster City Centre is a zone situated in the commercial and historic city centre of Lancaster. It captures key anchor loads, including the Royal Lancaster Infirmary and other public and non-domestic buildings. Due to these key anchor loads and density of demand, this area has been identified as a good opportunity for a heat network.

The Royal Lancaster Infirmary is expected to move site to a proposed location in Bailrigg East adjacent to Lancaster University, on a 2035-2039 timeline. The proposed site will fall within the Lancaster South HNZ, detailed further in Section 3.3. This information was confirmed after the modelling had been undertaken for this study, and therefore is not reflected in the data analysis within this report. However, the current site will likely be redeveloped to contain commercial and residential developments, which also present an opportunity for heat network connection. The existing site will remain in place to deliver services until the new hospital facilities are opened.

3.1.2) Lancaster City Centre - Existing Heat Networks

There is one operational campus heat network and one proposed district scale heat network in development in Lancaster City Centre, as described below.

Operational Heat Networks and Planned Expansions

Royal Lancaster Infirmary Campus Network

Royal Lancaster Infirmary Hospital is the only operational campus heat network in the Lancaster City Centre HNZ. The hospital has a recently refurbished energy centre, which houses three energy-efficient steam boilers; additionally, there is a CHP unit and backup generators. The University Hospitals of Morecambe Bay NHS Foundation Trust for the Royal Lancaster Infirmary has received funding from the HNES to upgrade its current network further[11].

Proposed Heat Networks – Early stage

The following heat network development schemes are in the early stages of masterplanning and feasibility and are not shown on Map D as firm plans on network routing are not yet established.

[11] Gemserv (2024) Heat networks across England and Wales receive a share of over £8 million for modernisations and improvements. Available at: https://gemserv.com/our-thoughts/heat-networks-across-england-and-wales-receive-a-share-of-over-8-million-for-modernisations-and-improvements/ (Accessed: 13 June 2024).

City Centre Heat Network Feasibility Study

LCC have undertaken heat network feasibility studies across the city area. One of the potential schemes identified is in the city centre, incorporating the area of new development at the Canal Quarter. As this is still an early-stage heat network, further details are currently not shared.

3.1.3) Lancaster City Centre - Initial Zone Opportunities

A single IZO was identified in the Lancaster City Centre zone. Potential routing[12] is shown in Figure 6 and summary statistics provided in Table 2.

Table 2: Lancaster City Centre – Summary Statistics for Initial Zone Opportunities[13]

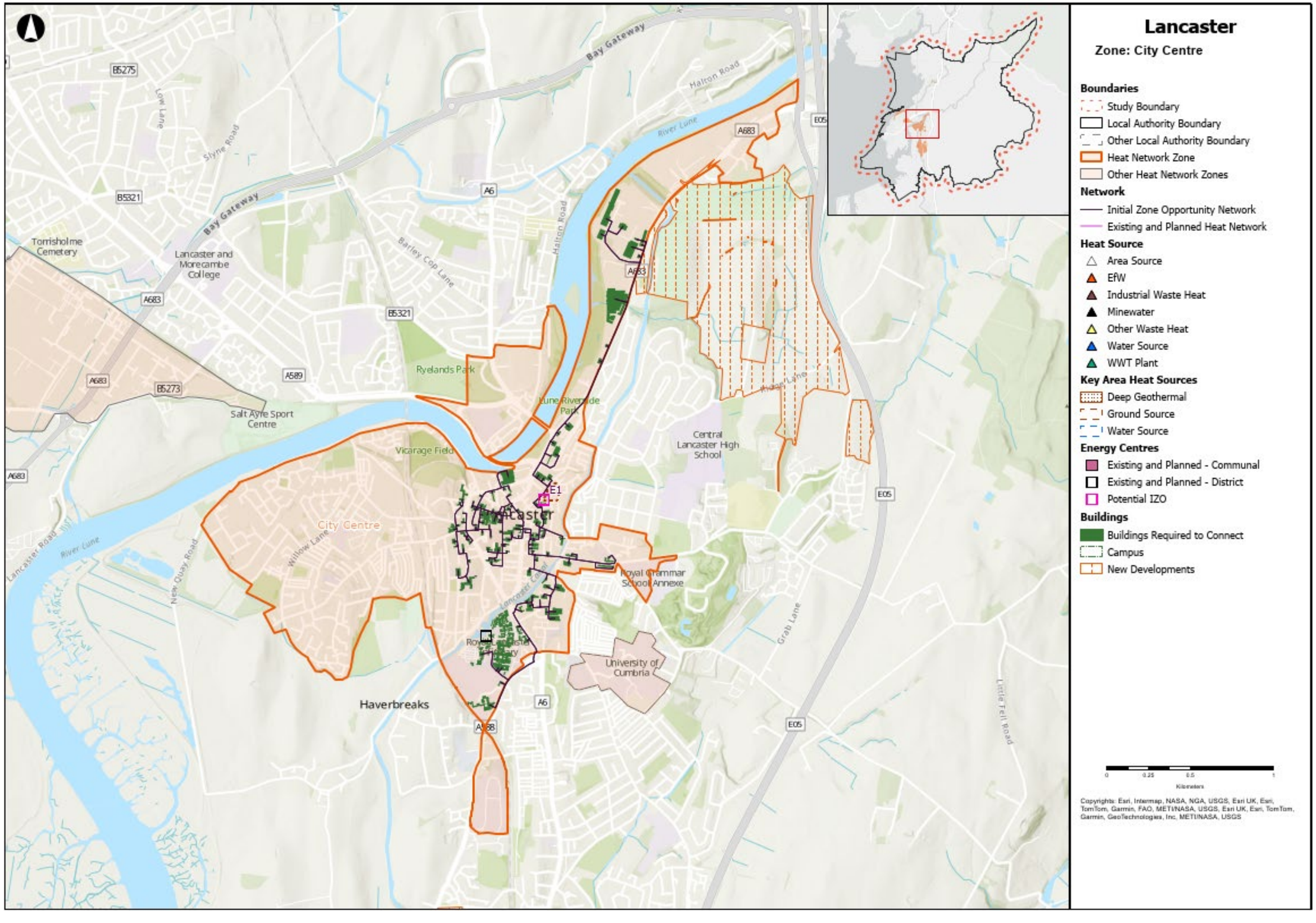
CapEx	Heat	Network	CO_{2e} savings	Linear Heat Density	Heat Sources
~£75m	>50GWh/yr	12km	10ktCO_{2e}/yr	5.3MWh/m	GSHP

The IZO covers most of the HNZ due to the high heat demand density across Lancaster city centre. It connects to over 50GWh/yr across 118 buildings, including the largest loads potentially required to connect, such as the hospital, noting that this site is expected to relocate in 2035-2039 as detailed further in Section 3.1.1. Buildings not connected are mainly residential or social housing areas, as well as some educational buildings where they are relatively far from the core of the IZO. The CapEx required is estimated at approximately £75m.

To ensure consistency when representing the scale of opportunity, buildings in the Lancaster town centre currently served by the Royal Lancaster Infirmary campus heat network are included. This is to ensure the scale of the opportunity for heat networks in the area are mapped and understood. This modelling was undertaken prior to the announcement of the expected relocation of Royal Lancaster Infirmary. The heat demand from the hospital will likely reduce 2035-2039 when services start to relocate to the new site and further change when redevelopment of the current site occurs.

[12] Routes can be expected to change as a better understanding of local constraints is developed through design.
[13] Please see Appendix 3 – Glossary, “Specific definitions” of the main report for definitions related to this table.

Figure 6: Initial Zone Opportunities in Lancaster City Centre HNZ



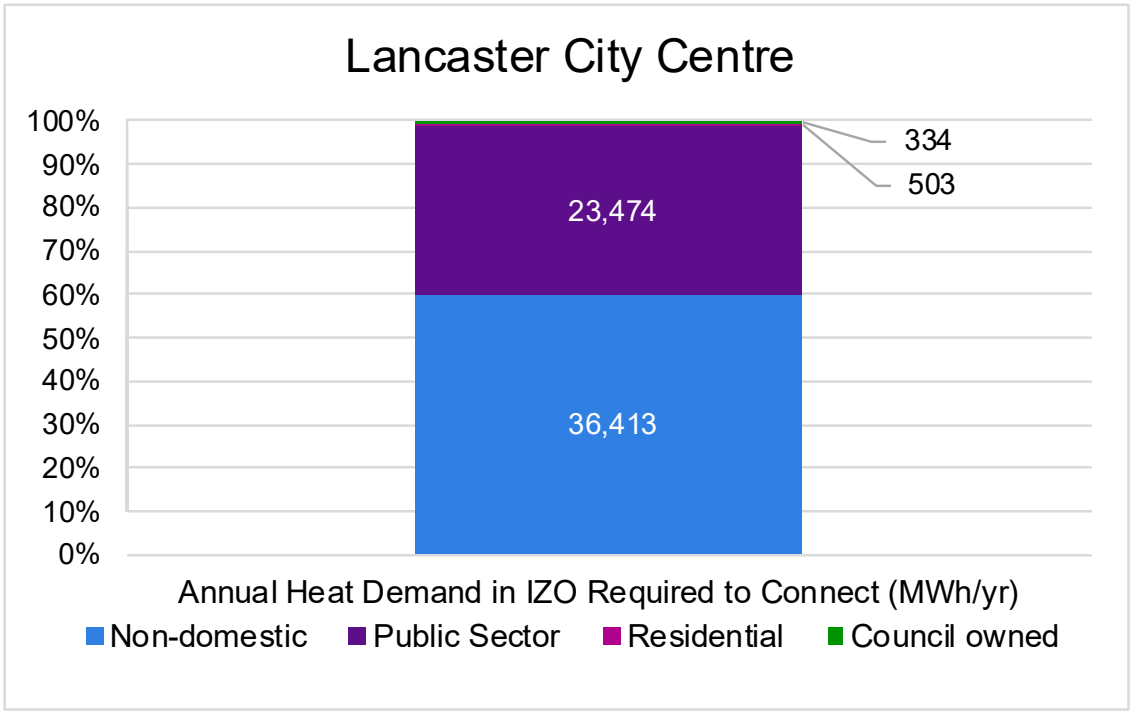
3.1.4) Lancaster City Centre – IZO Heat Demands

The heat demands identified 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 IZO connects 118 existing buildings with an overall heat demand of >50GWh/yr. It includes a mix of non-domestic and public sector properties anchored by the campus buildings. For the purposes of this study, no new developments or re-developments were included due to a lack of data. Figure 7 shows the breakdown of heat demand for buildings potentially required to connect by building type. Further details of the key heat demands for buildings potentially required to connect are provided in Table 3.

Figure 7: Lancaster City Centre - Categorisation of Heat Demand for Buildings Potentially Required to Connect in the IZO



Over 80% of buildings connected are non-domestic buildings, which is equivalent to 60% of the total heat demand. Public sector buildings make up the second greatest heat demand in part due to the large heat demand from the Royal Lancaster Infirmary Hospital. This demand will likely decrease once the hospital is relocated, although it is expected that the site will be re-developed into commercial and residential buildings.

Table 3: Lancaster City Centre - Key Heat Demands Required to Connect in the IZO[14]

Building name	Building category	Number of connections	Annual Heat Demand (MWh)	Data Source
Royal Lancaster Infirmary Hospital	Public Sector	1-14	16,550	ERIC National Dataset
Standfast & Barracks	Non-domestic	1-3	4,100	Benchmark (NZM)
Lansil Industrial Estate, Sofidel UK	Non-domestic	1	2,600	Benchmark (NZM)
Lansil Industrial Estate, Northwood Tissue	Non-domestic	1	1,700	Benchmark (NZM)
Ripley St. Thomas School	Public Sector	1-3	1,500	DEC
Sainsburys Supermarkets	Non-domestic	1-3	1,350	Benchmark (NZM)
The Crafty Scholar	Non-domestic	1	1,100	Benchmark (NZM)
Valuation Office Agency	Non-domestic	1-3	1,000	Benchmark (NZM)
Shops (TK-Maxx, Squires)	Non-domestic	1-2	850	Benchmark (NZM)
Rheumatology Dept, UHoMB	Public Sector	1-3	800	Benchmark (NZM)
Lancaster Girls Grammar School	Public Sector	1-2	550	DEC

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

3.1.5) Lancaster City Centre – IZO Heat Sources

Lancaster City Centre is a zone located in a relatively dense urban area on the banks of a river and a canal. However, due to the river's tidal character and the canal's limited flows, water source heat pumps (WSHPs) have not been considered for this zone, and a separate assessment would be required to understand it's potential. In areas where the density of buildings decreases, there is an opportunity to explore surrounding green spaces for GSHPs and energy centre locations. A separate study has identified that a GSHP system is feasible in the area to cover the baseload demand for a network similar in scope. The zone includes industrial areas, but no heat intensive sites have been identified as potential significant sources of waste heat.

Whilst an existing energy centre supplies the hospital, it is insufficient to support significant expansion, such as the proposed network. Finding space to locate energy centres in this densely populated area will be critical to successful delivery of the zone. The chosen option is in the Canal Quarter, an undeveloped area near the centre of heat demand.

Table 4 and Table 5 summarise the key heat sources and potential energy centre locations identified. These are also shown in the zone-level map in Figure 6 in Section 3.1.3 and on the city-level Map C in Appendix 1.

Table 4: Lancaster City Centre - Key Heat Source Opportunities for the IZO

Heat source type	Capacity (kWp)	Temperature (ºC)	Potential Energy Centre [Ref number]
GSHP	15,000	50-60	E1

Table 5: Lancaster City Centre - Potential IZO Energy Centre Locations

EC Ref number	Site type	Size (m^2)	Ownership	Heat Source
E1	Land	2,250[15]	Council	GSHP

3.1.6) Lancaster 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 routing was developed solely around buildings which could be potentially required to connect and did not consider potential voluntary

[15] Energy centre size required assumed 150m^2/MW. Additional surveys are recommended to support approximation.

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 6 shows the network statistics including the network length and associated cost. Please see Appendix 5 for related methodology statements and assumptions.

The energy centre is proposed to be located centrally, near one of the few central undeveloped parcels of land. As can be seen in Figure 6, from the energy centre the heat distribution pipework runs north and south connecting additional buildings potentially required to connect. It does not cross the River Lune, however, it does cross the canal in central Lancaster.

Table 6: Lancaster City Centre - Indicative Heat Network Statistics for the IZO

IZO Heat Network description	Network length (km)	Network cost (£m)
Lancaster City Centre	12	36

3.1.7) Lancaster City Centre – IZO Key Constraints and Mitigations

[C1] Road crossing: The A588 is a key road approaching Lancaster from the south. The proposed pipework route overlaps a significant stretch of the road. A feasibility study may be required to ascertain the potential impacts and minimise disruption.

[C2] Road crossing: The A6 is a major road that passes through Lancaster City Centre, which is largely unavoidable at certain points. The proposed pipework route overlaps and crosses the A6 at multiple points but has been avoided where practical. A feasibility study may be required to ascertain the potential impacts and minimise disruption

[C3] Road crossing: The A683 is a key road located within Lancaster City Centre IZO and connects from the A6 to the north of the zone. The A683 is a key route used by the proposed pipework and overlaps along significant stretches of the road. Therefore, a feasibility study may be required to ascertain the potential impacts and minimise disruption.

3.2) Morecambe

3.2.1) Morecambe – HNZ Summary

Morecambe is a Strategic HNZ situated in the commercial centre of Morecambe town. The zone contains a mix of public sector, retail, and commercial buildings and include key anchor loads, including Queen Victoria Hospital and large supermarkets.

The main heat source is anticipated to be derived from GSHPs. The nature of the zone means that the heat network development has few physical barriers. It comprises one key road, although its presence is not anticipated to prohibit the development of a heat network.

3.2.2) Morecambe – Existing Heat Networks

There are no existing, planned or proposed heat networks identified in Morecambe HNZ.

3.2.3) Morecambe – Initial Zone Opportunities

A single IZO was identified in the Morecambe zone. Potential routing[16] is shown in Figure 8 and summary statistics provided in Table 7.

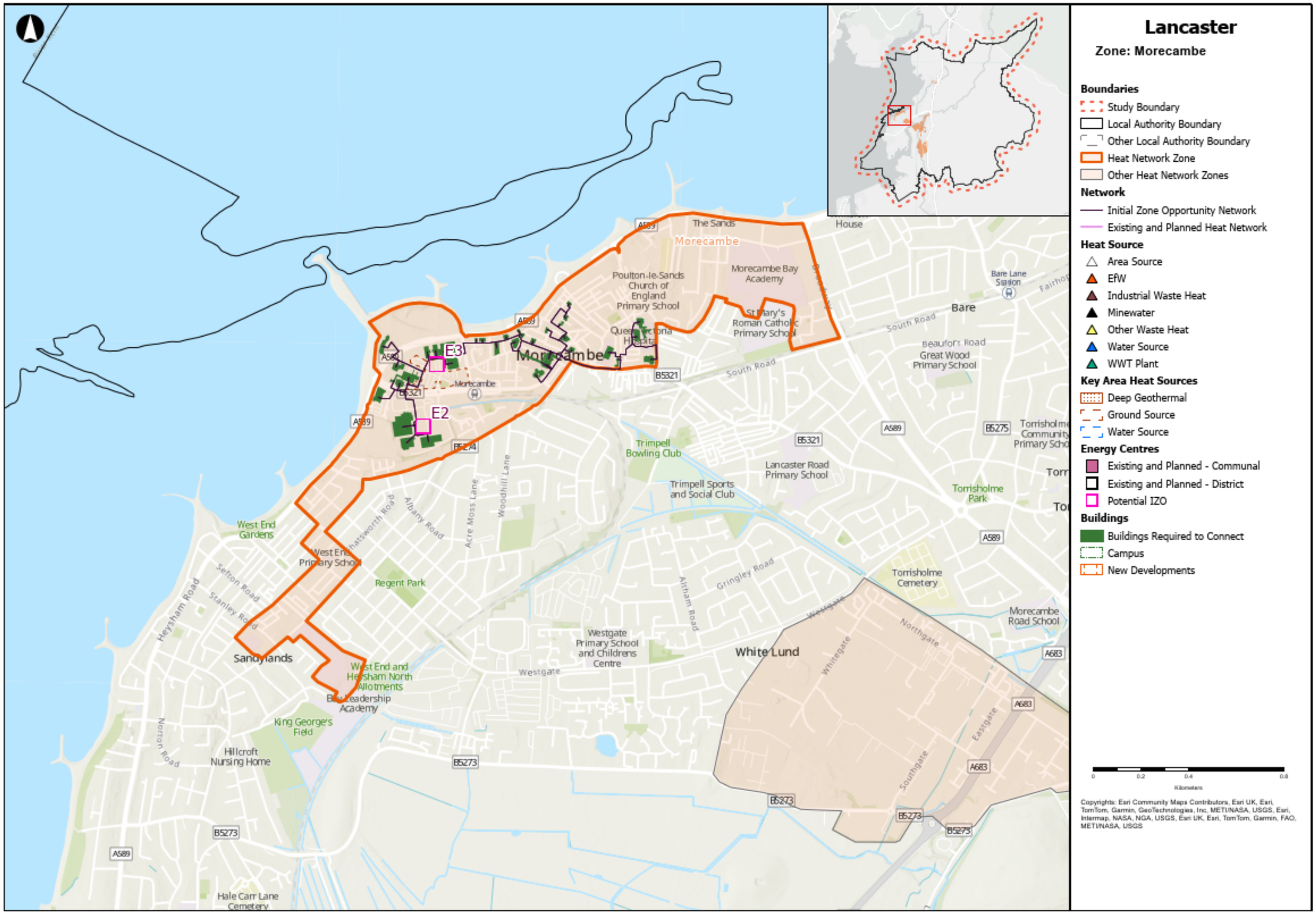
Table 7: Morecambe - Summary Statistics for Initial Zone Opportunities[17]

CapEx	Heat	Network	CO_{2e} savings	Linear Heat Density	Heat Sources
~£25m	>15GWh/yr	4km	2ktCO_{2e}/yr	4.0MWh/m	GSHP

The network spans a heat dense area in Morecambe town centre, where several of the largest buildings potentially required to connect are located. Buildings not connected are mainly non-domestic, as well as some educational buildings where they are not proximal to the proposed route. The IZO connects over 15GWh/yr across 38 buildings. The CapEx is estimated to be around £25m.

[16] Routes can be expected to change as a better understanding of local constraints is developed through design.
[17] Please see Appendix 3 – Glossary, “Specific definitions” of the main report for definitions related to this table.

Figure 8: Initial Zone Opportunity in Morecambe HNZ

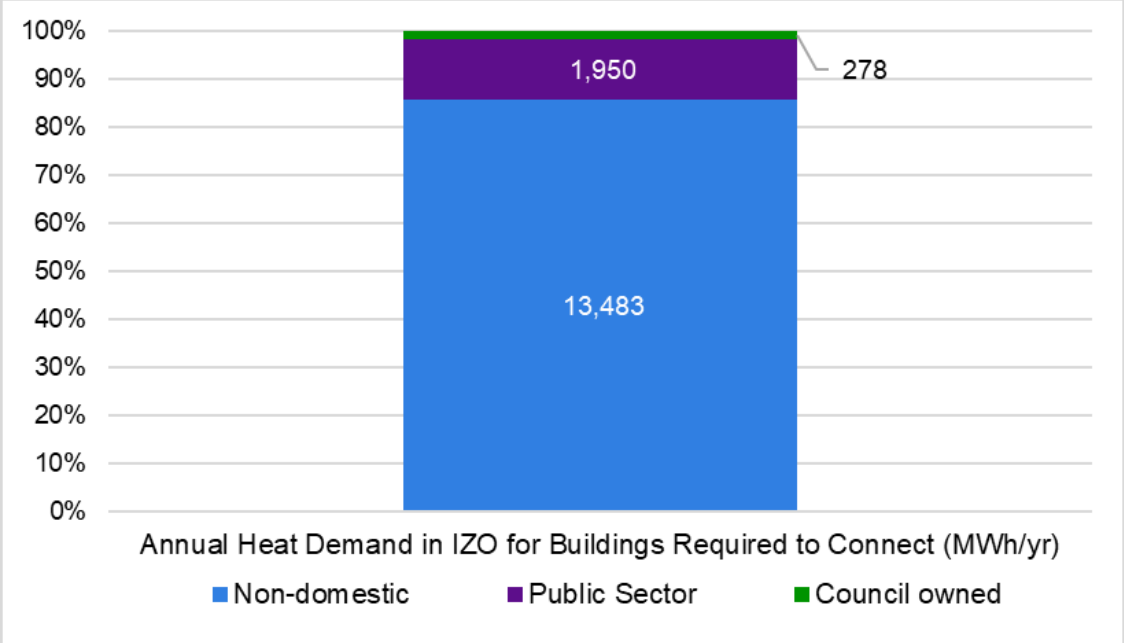


3.2.4) Morecambe – IZO Heat Demands

The IZO connects to 38 existing buildings with an overall heat demand of >15GWh/yr. It includes a large proportion of non-domestic buildings, both retail and entertainment buildings. For the purposes of this study, no new developments were included. Figure 9 shows the breakdown of heat demand for buildings potentially required to connect by building type.

Over 80% of buildings identified for connection are non-domestic buildings, equivalent to 86% of the total heat demand. Public sector buildings make up the second greatest heat demand, comprising 11% of buildings and 12% of the total heat demand. Two council buildings comprise the remaining 2% of heat demand.

Figure 9: Morecambe - Categorisation of Heat Demand for Buildings Potentially Required to Connect in the IZO



Further details of the key heat demands for buildings potentially required to connect are provided in Table 8. No single building dominates the list. The Morrisons supermarket has the largest estimated annual demand at around 1,850 MWh/yr, and Morecambe Bay School closes the list at almost 525 MWh/yr. Other buildings in the list consist of a hospital, more retail buildings, sports and leisure facilities, and a hotel.

Table 8: Morecambe - Key Heat Demands Required to Connect in the IZO[18]

Building name	Building category	Number of connections	Annual Heat Demand (MWh)	Data Source
Morrison Supermarket	Non-domestic	1	1,850	NZM
Retail (Next / Homebase)	Non-domestic	2	1,050	Benchmark (NZM)
Retail (Marine road west)	Non-domestic	6	950	Benchmark (NZM)
Queen Victoria Hospital	Public Sector	3-7	900	ERIC National Dataset
Sport First	Non-domestic	1-2	850	Benchmark (NZM)
Jump Rush	Non-domestic	1-2	650	Benchmark (NZM)
Retail (Central Drive)	Non-domestic	3-7	600	Benchmark (NZM)
Aldi	Non-domestic	1-2	550	Benchmark (NZM)
Midland Hotel	Non-domestic	1-3	550	Benchmark (NZM)
Morecambe Bay Cp School	Public Sector	1-3	525	Benchmark (NZM)

3.2.5) Morecambe – IZO Heat Sources

The HNZ is located at the town seafront and includes a number of retail and leisure centres around which land could be repurposed for GSHPs and potentially serve as a location for an energy centre. Other than local supermarkets refrigeration systems that could be explored at a more detailed stage, no significant local waste heat opportunities were identified.

Finding space to locate energy centres in this urban area will be critical. Potential options include developing energy centres in car parks in the centre of the zone.

Table 9 and Table 10 summarise the key heat sources and potential energy centre locations identified. These are also shown in the zone-level map in Figure 8 in Section 3.2.3 above and on the city-level Map C in Appendix 1.

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

Table 9: Morecambe - Key Heat Source Opportunities for the IZO

Heat source type	Opportunity Capacity (kWp)	Temperature (ºC)	Potential Energy Centre (Ref number)
GSHP	2,050	45-60	E2
GSHP	2,050	45-60	E3

Table 10: Morecambe - Potential IZO Energy Centre Locations

Ref #	Site type	Size (m^2)	Ownership	Heat Source
E2	Car park	310	Council	GSHP
E3	Car park	310	Morrisons Supermarket	GSHP

3.2.6) Morecambe – IZO Heat Distribution

Table 11 shows the network statistics including the network length and associated costs. Please refer to Section 3.1.6 and Appendix 5 for the assumptions used.

Table 11: Morecambe - Indicative Heat Network Statistics for the IZO

IZO Heat Network description	Network length (km)	Network cost (£m)
Morecambe	4	15

3.2.7) Morecambe – IZO Key Constraints and Mitigations

[C4] Road crossing: The A589 is a major coastal road along Morecambe Bay. There is only one crossing of the road by the proposed pipework to connect the Midland Hotel to the network. A feasibility study may be required to ascertain the potential impacts and minimise disruption.

3.3) Lancaster South

3.3.1) Lancaster South – HNZ Summary

Lancaster South is a Strategic HNZ based entirely around the potential for residential development in the area and the preferred location for the new Royal Lancaster Infirmary site which is expected to relocate between 2035-2039. If pipework can be built simultaneously with other utilities, there is an opportunity to provide low-carbon heat at reduced network cost to new developments.

There is also the potential for low carbon heat to be supplied to a network via heat recovery at the wastewater treatment works in Stodday, located less than 1km from the zone boundary. Given the lack of existing infrastructure, there are no known key constraints.

3.3.2) Lancaster South – Existing Heat Networks

Proposed Heat Networks – Early stage

The following heat network development schemes are in early HN development stages of master-planning and feasibility and are not shown on Appendix D maps as their viability has not yet been established.

Lancaster South Broad Location for Growth

LCC reviewed the area in an HNDU-funded feasibility study. The potential for new development in this location was identified as a potential heat network scheme, connecting to the waste water treatment works run by United Utilities.

3.3.3) Lancaster South – Initial Zone Opportunities

A single IZO was identified in the Lancaster South zone, summary statistics for which is provided in Table 12.

Table 12: Lancaster South - Summary Statistics for Initial Zone Opportunities[19]

CapEx	Heat	Network	CO_{2e} savings	Linear Heat Density	Heat Sources
~£35m	>10GWh/yr	24km	2ktCO_{2e}/yr	0.5MWh/m	Waste water treatment plant

Lancaster South has been proposed as an IZO since the area was expected to be developed over the coming years. Potential routing for a network has not been considered as it will be dependent on the build out of the new developments. The length and associated CapEx has

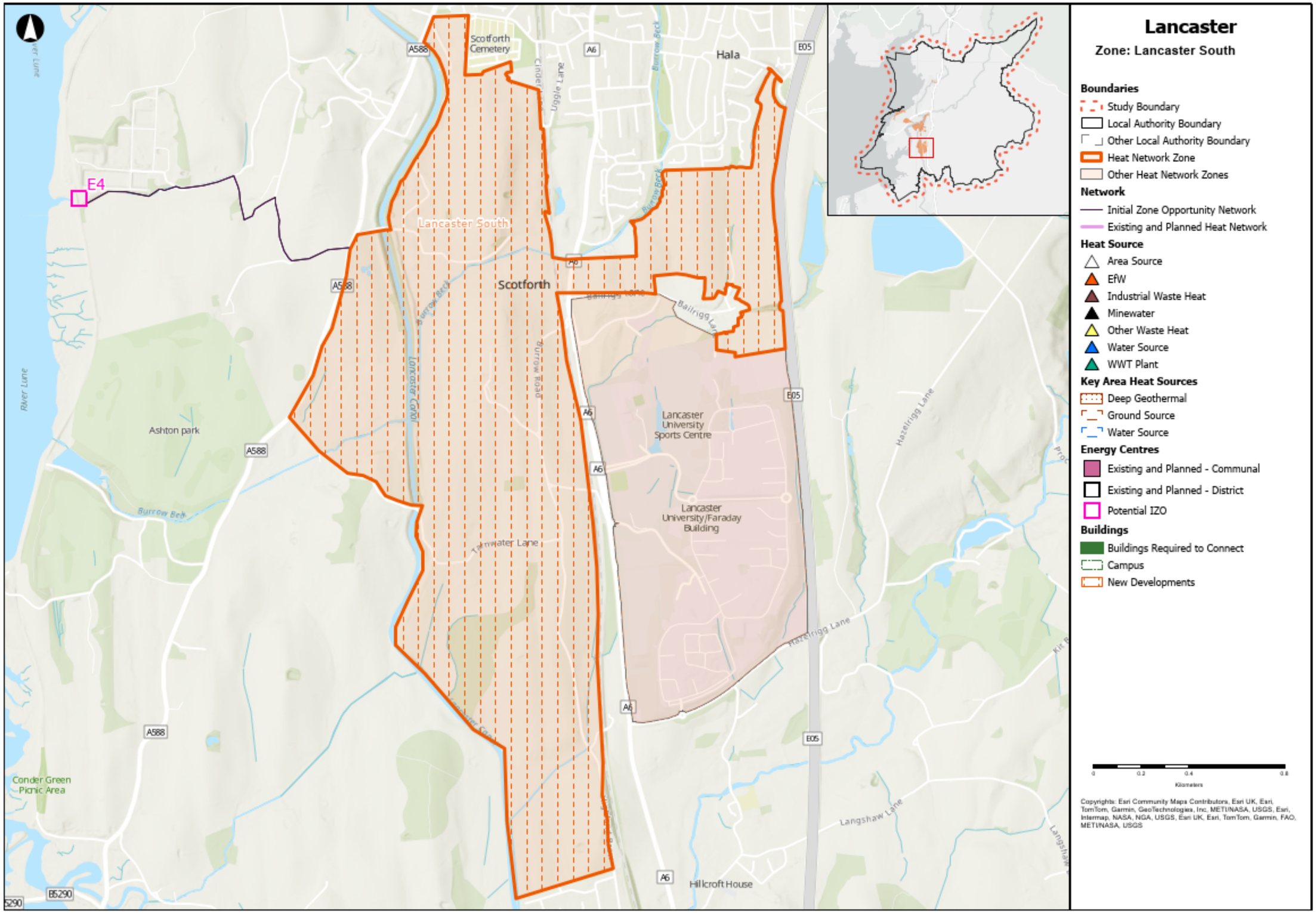
[19] Please see Appendix 3 – Glossary, “Specific definitions” of the main report for definitions related to this table.

therefore been estimated based on a consistent approach towards new developments across the Pilot programme.

It has been modelled on the assumption that low carbon heat is supplied to over 3,500 new dwellings with a heat demand of over 10GWh/yr. The overall network is anticipated to have a low linear heat density in the region of 0.5 MWh/m, however, if pipework can be built simultaneously with other utilities, there is an opportunity to provide low-carbon heat at reduced network cost to the new development.

A site located north of Lancaster University is the preferred location of the new Royal Lancaster Infirmary, which is expected to have a construction start date before 2039. This will increase the heat demand within the zone and presents an opportunity for expansion upon completion. The proposed location can be seen in Figure 10.

Figure 10: Initial Zone Opportunity in Lancaster South HNZ



3.3.4) Lancaster South – IZO Heat Demands

The IZO connects entirely to new developments as shown in Figure 11. It is assumed to connect to mainly residential buildings, including 3,500 new homes and three school buildings. Further details of the key heat demands for buildings potentially required to connect are provided in Table 13.

Figure 11: Lancaster South - Categorisation of Heat Demand for Buildings Potentially Required to Connect in the IZO

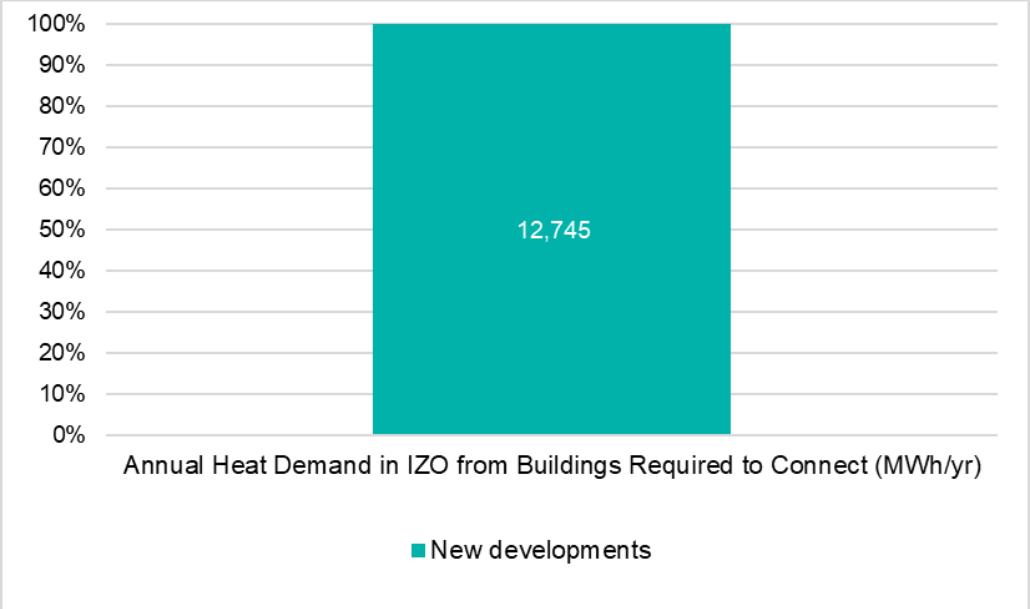


Table 13: Lancaster South - Key Heat Demands Required to Connect in the IZO[20]

Building name	Building category	Number of connections	Annual Heat Demand (MWh)	Data Source
New build homes	New developments	Unknown	12,250	Pilot methodology
New build schools	New developments	3	500	Pilot methodology

3.3.5) Lancaster South – IZO Heat Sources

The IZO is proposed to be supplied through a water source heat pump (WSHP) located at the wastewater treatment works (WWTW) in Stodday, operated by United Utilities and adjacent to the River Lune (E5). From a preliminary review, the scale of heat available is appropriate to the new development modelled. Environmental modelling may be needed to understand the impact of recovering heat on the WWTW and discharge to the river. As a fall-back system, there is land provisionally available within the new development area which could potentially house an energy centre for a location-agnostic source, such as an ASHP (E6).

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

The wastewater treatment works is located less than 1km from the zone boundary and is assumed in this modelling to travel the distance from the energy centre to the zone boundary directly. The green-field operational spaces around the WWTW have been selected as a provisional energy centre location.

Table 14 and Table 15 summarise the key heat sources and potential energy centre locations. These are also shown on the zone-level map in Figure 10 in Section 3.3.3 and Appendix 1: Map C.

Table 14: Lancaster South - Key Heat Source Opportunities for the IZO

Heat source type	Capacity (kWp)	Temperature (ºC)	Potential Energy Centre (Ref number)
WWTW	2,800	50-60	E4

Table 15: Lancaster South - Potential IZO Energy Centre Locations

Ref #	Site type	Size (m^2)	Ownership	Heat Source
E4	Existing	850	United Utilities	WWTW

3.3.6) Lancaster South – IZO Heat Distribution

Table 16 shows the network statistics including the network length and associated costs. Please refer to Section 3.1.6 and Appendix 5 for the assumptions used.

Table 16: Lancaster South - Indicative Heat Network statistics for the IZO

IZO Heat Network description	Network length (km)	Network cost (£m)
Lancaster South	24	26

3.3.7) Lancaster South – IZO Key Constraints and Mitigations

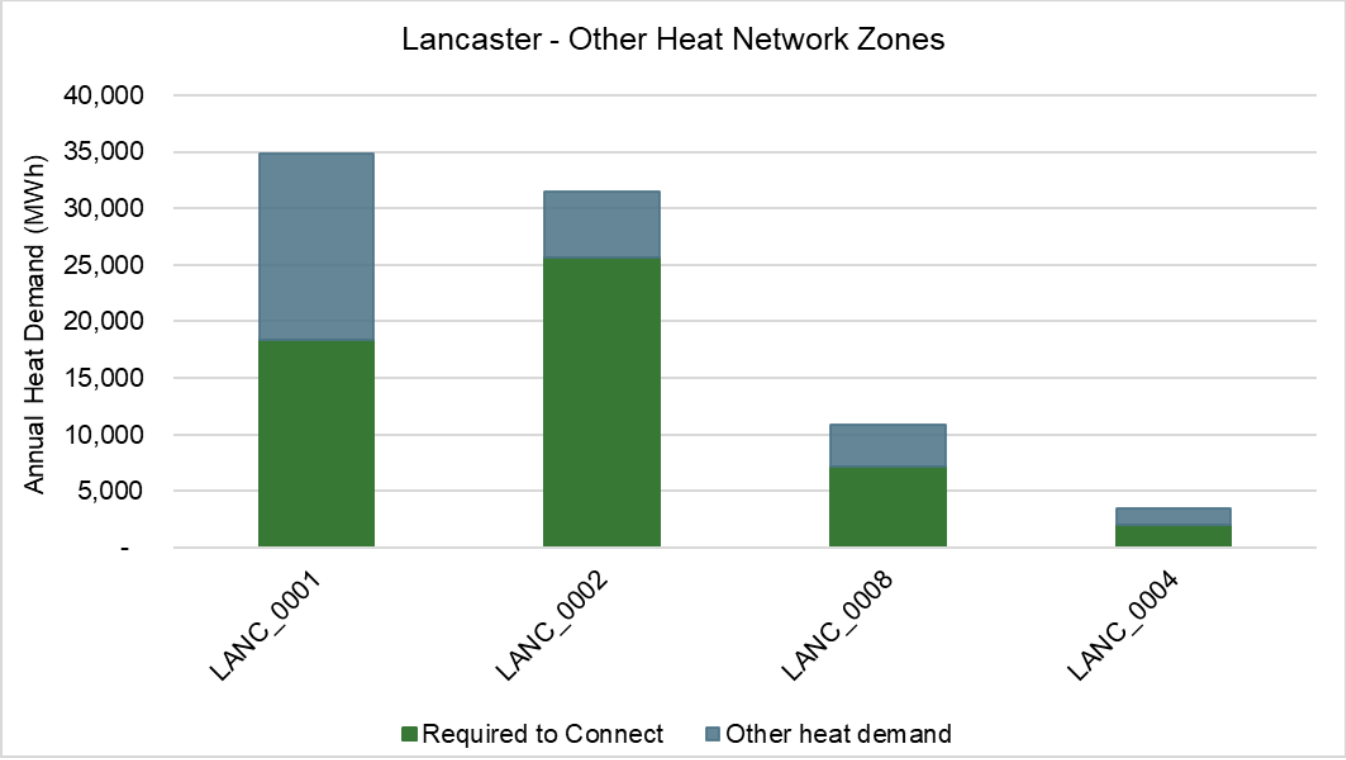
There are no major constraints identified for the proposed network route.

4) Other Heat Network Zones

This section describes the 'Other' potential heat network zones that were identified in Lancaster. 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 12 illustrates the total annual heat demand, and the proportion of which is associated with buildings that may be potentially 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 12: Total Heat Demand and Proportion Required to Connect in Other HNZs



Lancaster University (LANC_0001) is situated to the south of the city centre, nearby the Lancaster South HNZ and is not considered strategic because the zone boundaries are confined to the university campus which already has a heat network. The zone is entirely made of educational buildings which make up the Lancaster University campus. The existing heat network is supplied with heat from gas boilers, but £21m has been secured via the Green Heat Network Fund (GHNF) to begin the construction of a new energy centre which will be

operational by Spring 2027. The site will include a large air source heat pump to heat 95% of the buildings on the campus[21].

Lancaster University of Cumbria (LANC_0004) is situated close to the city centre and is not considered strategic because the zone boundaries are confined to the university campus which already has an existing heat network. The University of Cumbria Lancaster Campus includes buildings of various ages, some have dedicated gas boiler plant rooms, and around 10 campus buildings are currently served by a heat network. The system uses a gas fired boiler system to serve the connected buildings. Due to the age of the communal system, the changed heat demands on the campus, and the desire to decarbonise the campus energy consumption, the heat network is due for renewal.

LANC_0002 is situated to the west of Lancaster City Centre and covers the White Lund Industrial Estate. It is dominated by buildings of a commercial and light industrial nature and contains many large buildings, for which the heat demand is not known.

LANC_0008 is situated to the north of Lancaster City, though is not considered strategic due its smaller size. It includes several educational buildings as well as a commercial and industrial estate.

[21] Lancaster University (2024) https://www.lancaster.ac.uk/facilities/estates/net-zero-energy-project/

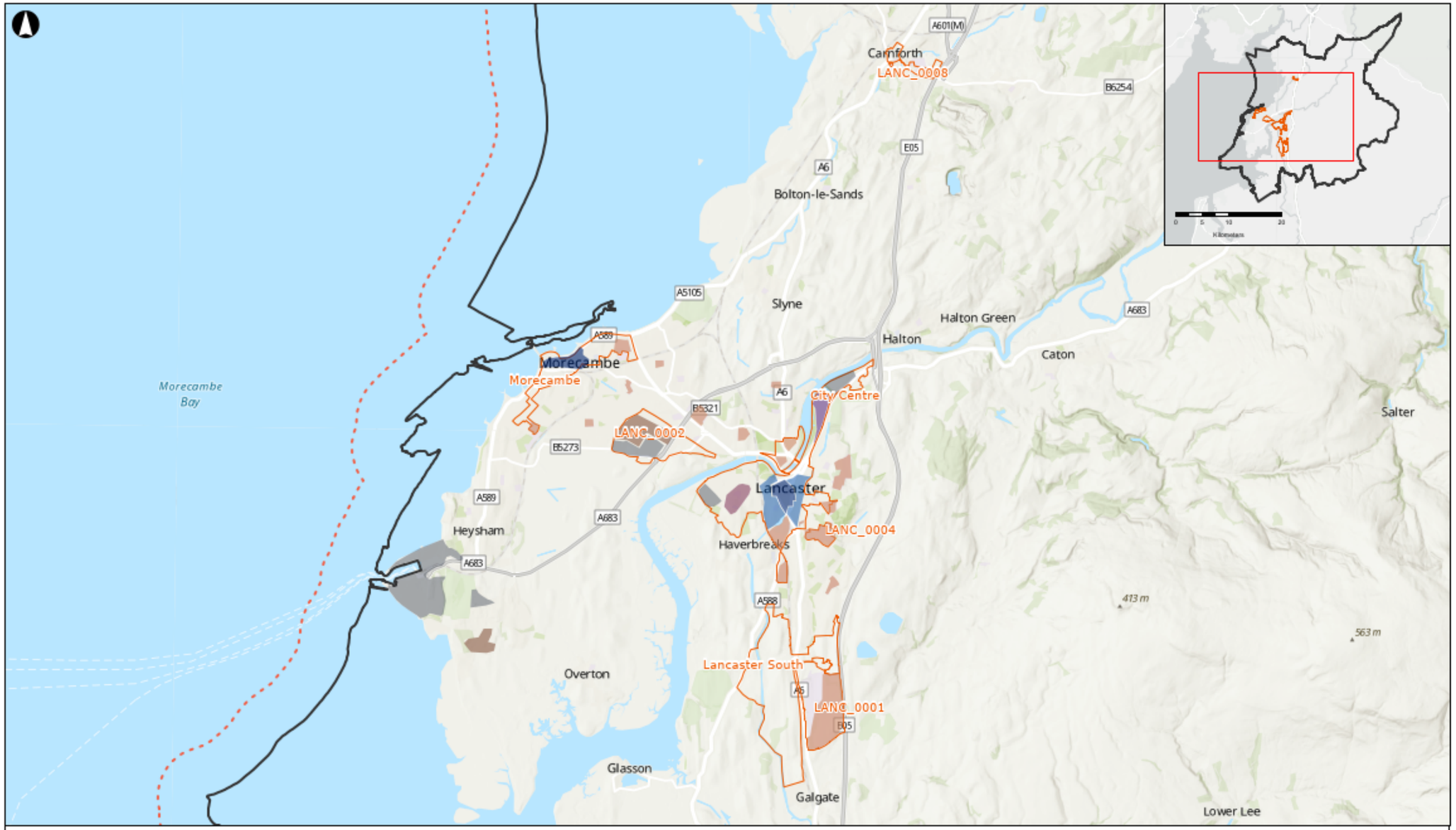
Appendix 1: Maps and Legends

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

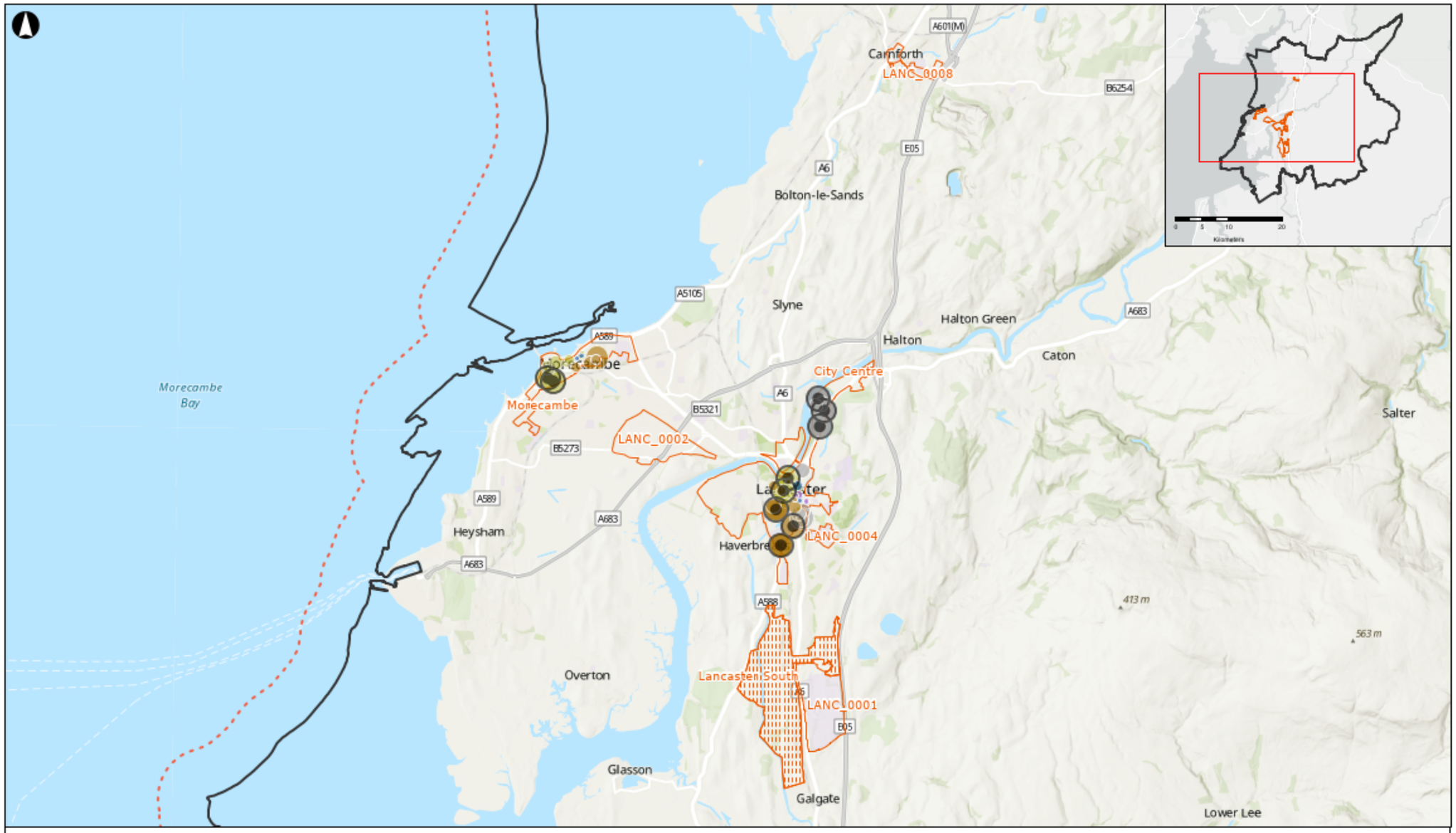
Legend / icon	Relevant map(s)	What this represents on the map	Comments on interpretation
	Report maps	Study boundary	Extends 1km beyond Local Authority boundary to include cross boundary opportunities
	Report maps	Local Authority boundary	
	Report maps	Other Local Authority boundary	
	Report maps	Heat 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. Lancaster 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
- Other public sector
- Residential with communal heating
- Non-domestic private buildings
- Industrial
- Top heat demands

Heat Demand (MWh/Year)
- < 200
- 200 - 400
- 400 - 600
- > 1,000

Kilometers

Scale: 1:75,000

Coordinate System: British National Grid

Department for Energy Security & Net Zero

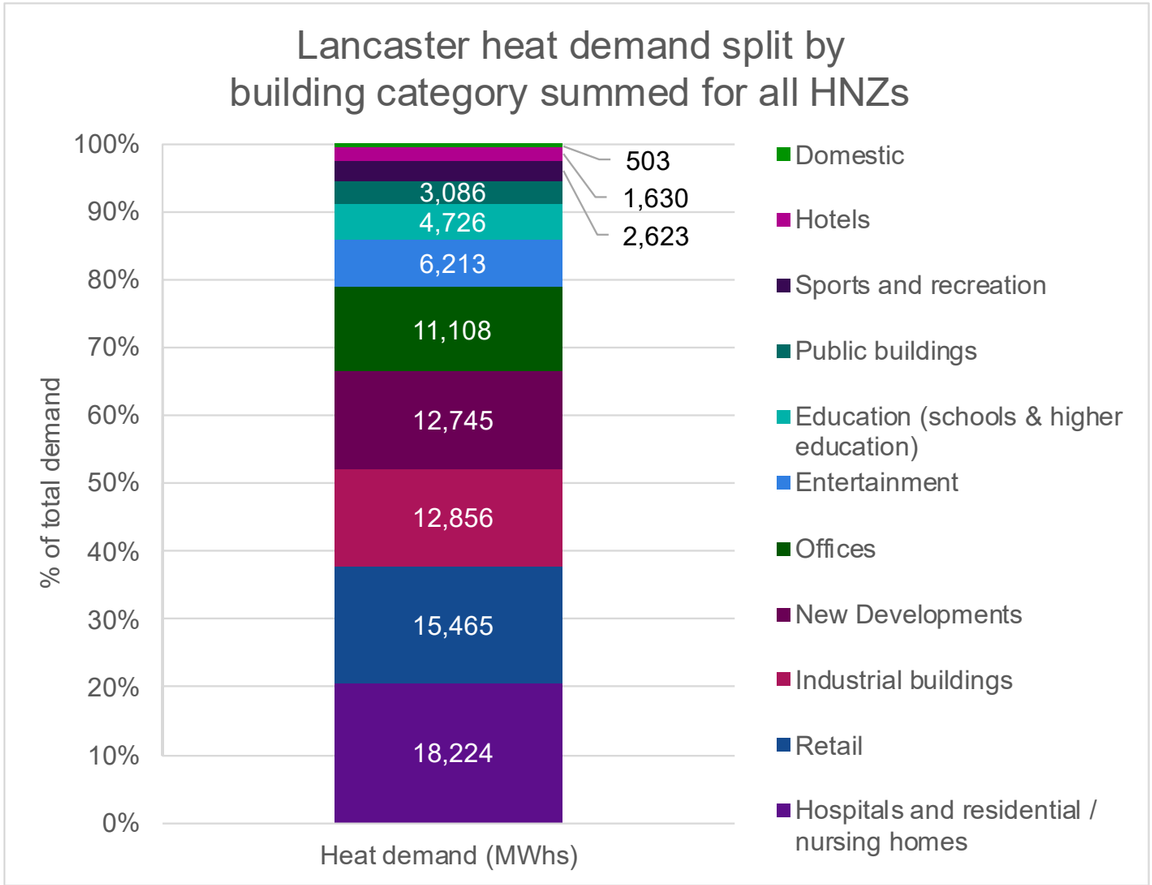
Lancaster

Map B

Key Heat Demand

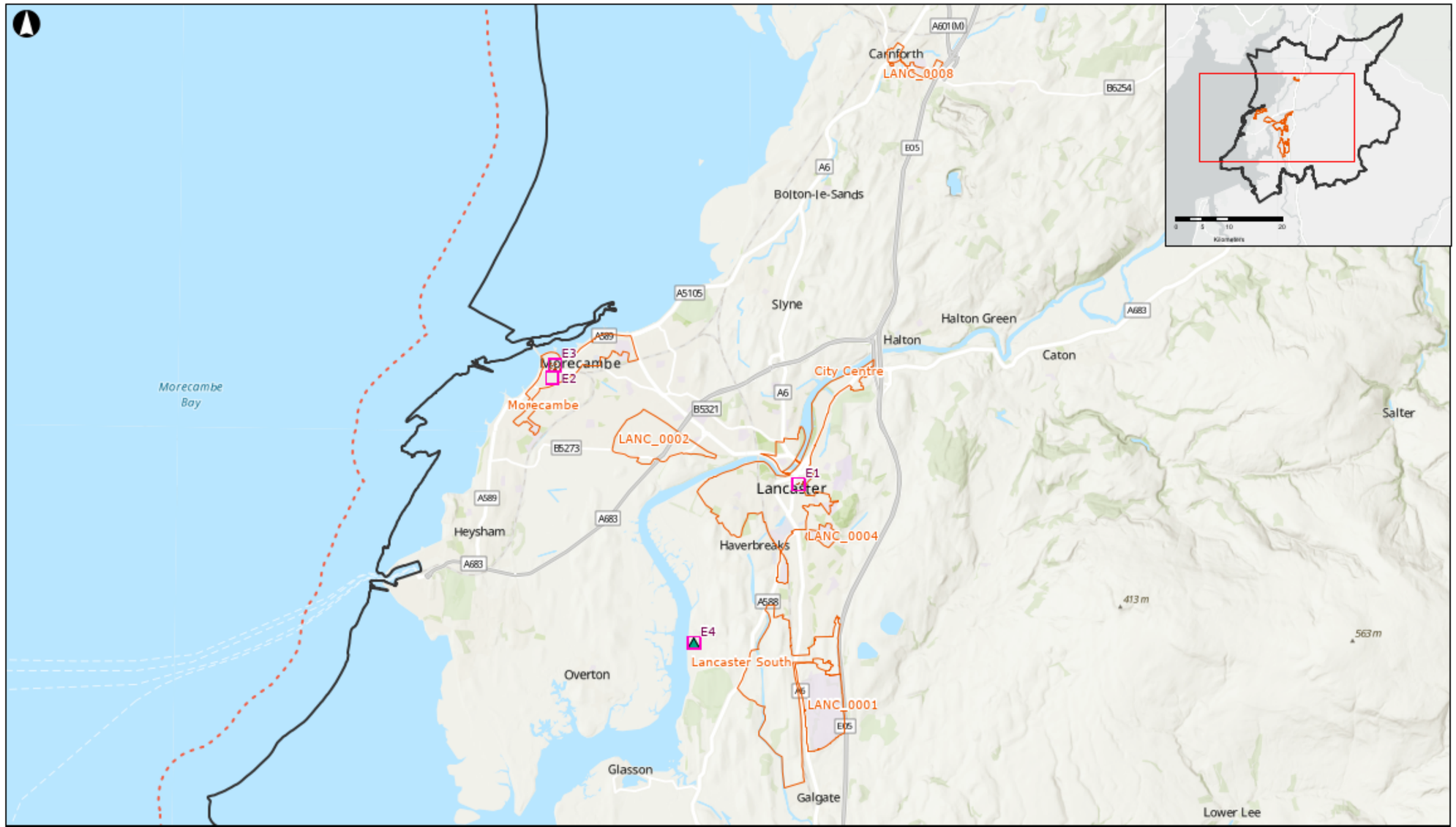
Table 17: Heat Demand split further by Building Categories across all Initial Zone Opportunities Identified in Strategic HNZs in the Study Area

Building category	Number of buildings required to connect in this category	Annual Heat Demand (buildings required to connect) across strategic HNZs (MWh)
Hospitals and residential / nursing homes	6	18,224
Retail	40	15,465
Industrial buildings	13	12,856
New Developments	3,503 (units)	12,745
Offices	39	11,108
Entertainment	26	6,213
Education (schools & higher education)	6	4,726
Public buildings	12	3,086
Sports and recreation	5	2,623
Hotels	6	1,630
Domestic	3	503
Totals	**3,659**	**89,179**

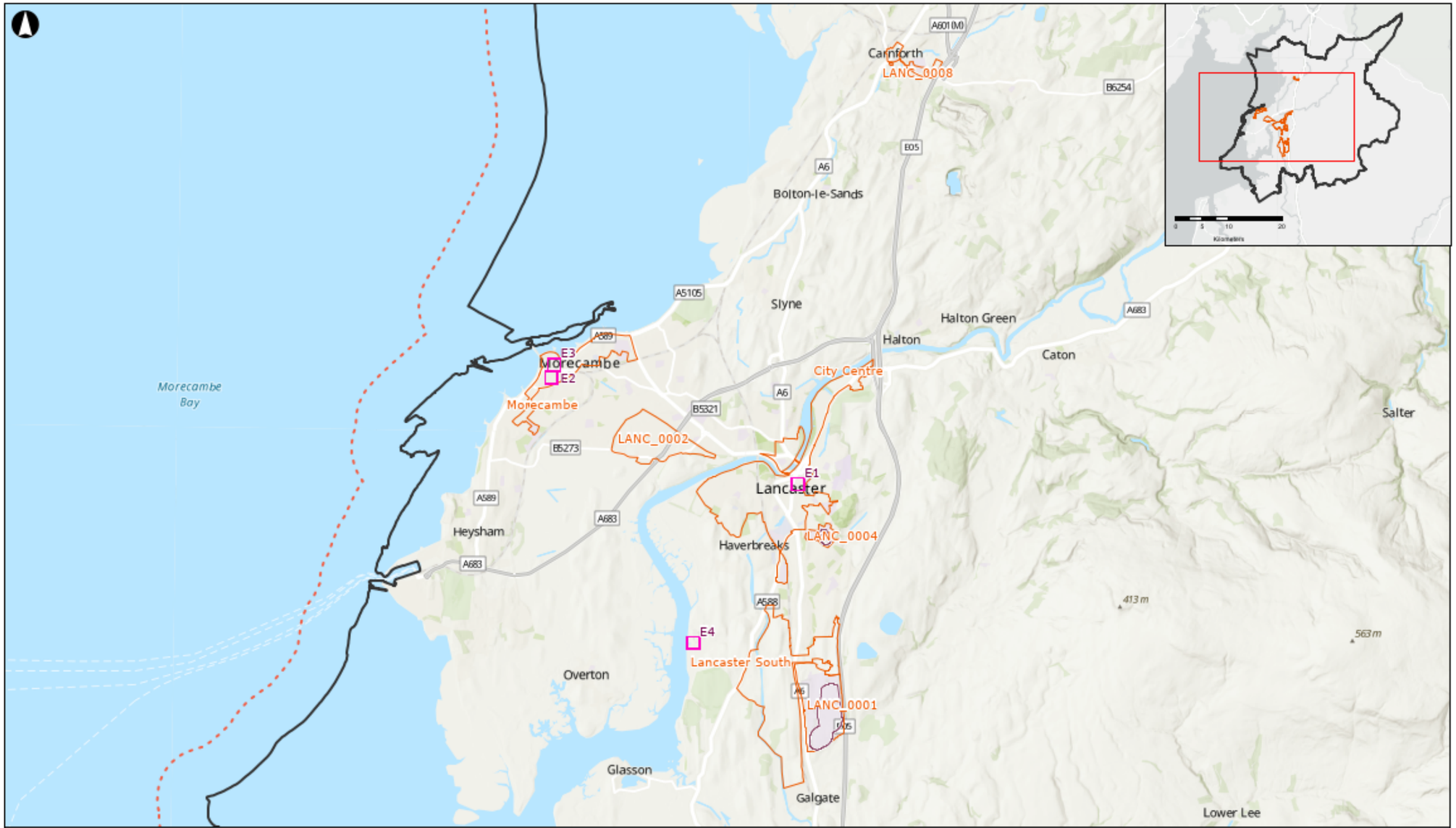


Note: In Lancaster there are seven HNZs with a total of three IZOs identified across them. The table and graph above summarises the heat demand for buildings potentially required to connect to these IZOs.

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

0 1 2 4
Kilometers

Scale: 1:75,000
Coordinate System: British National Grid

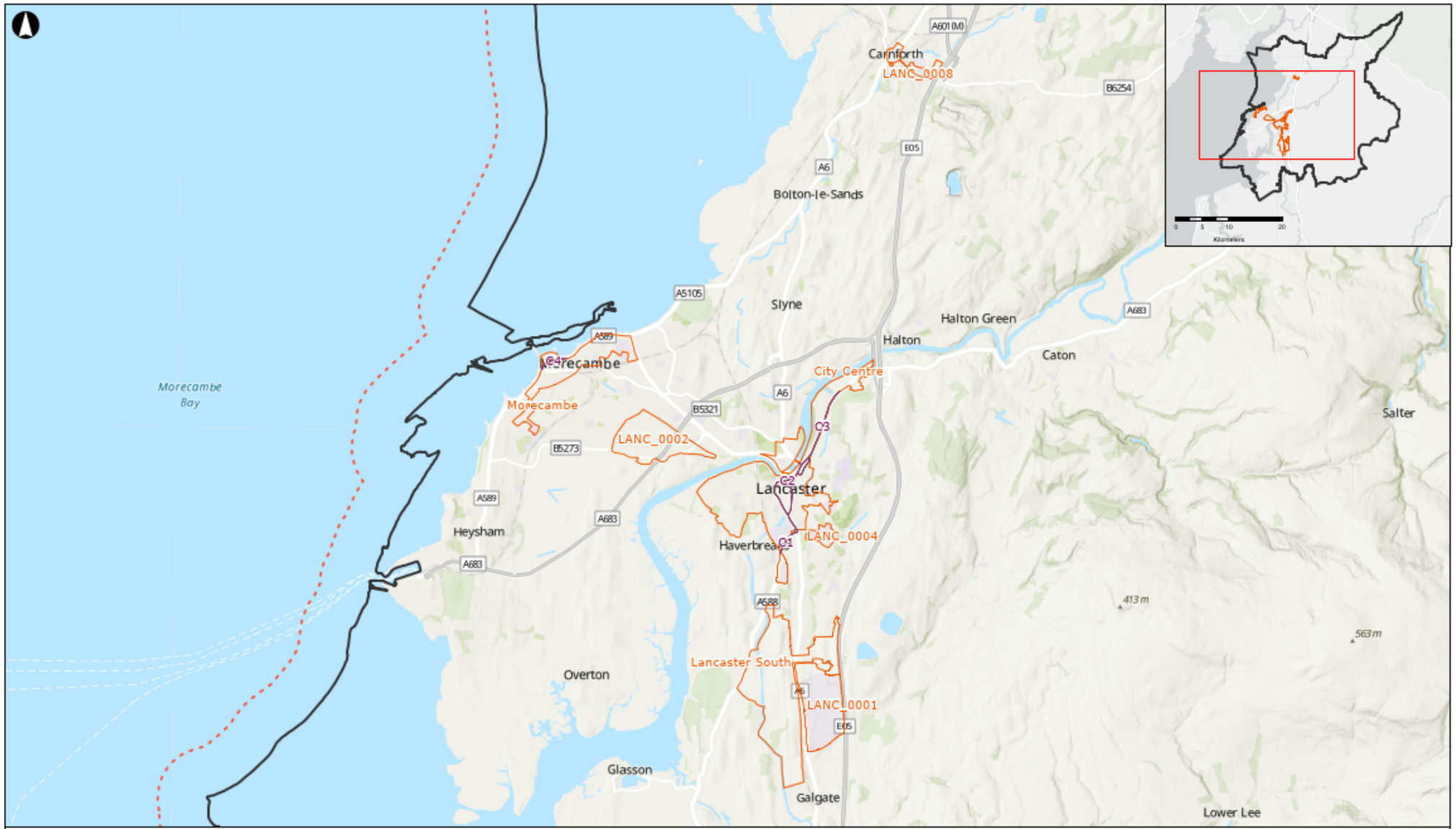
Department for Energy Security & Net Zero

Lancaster

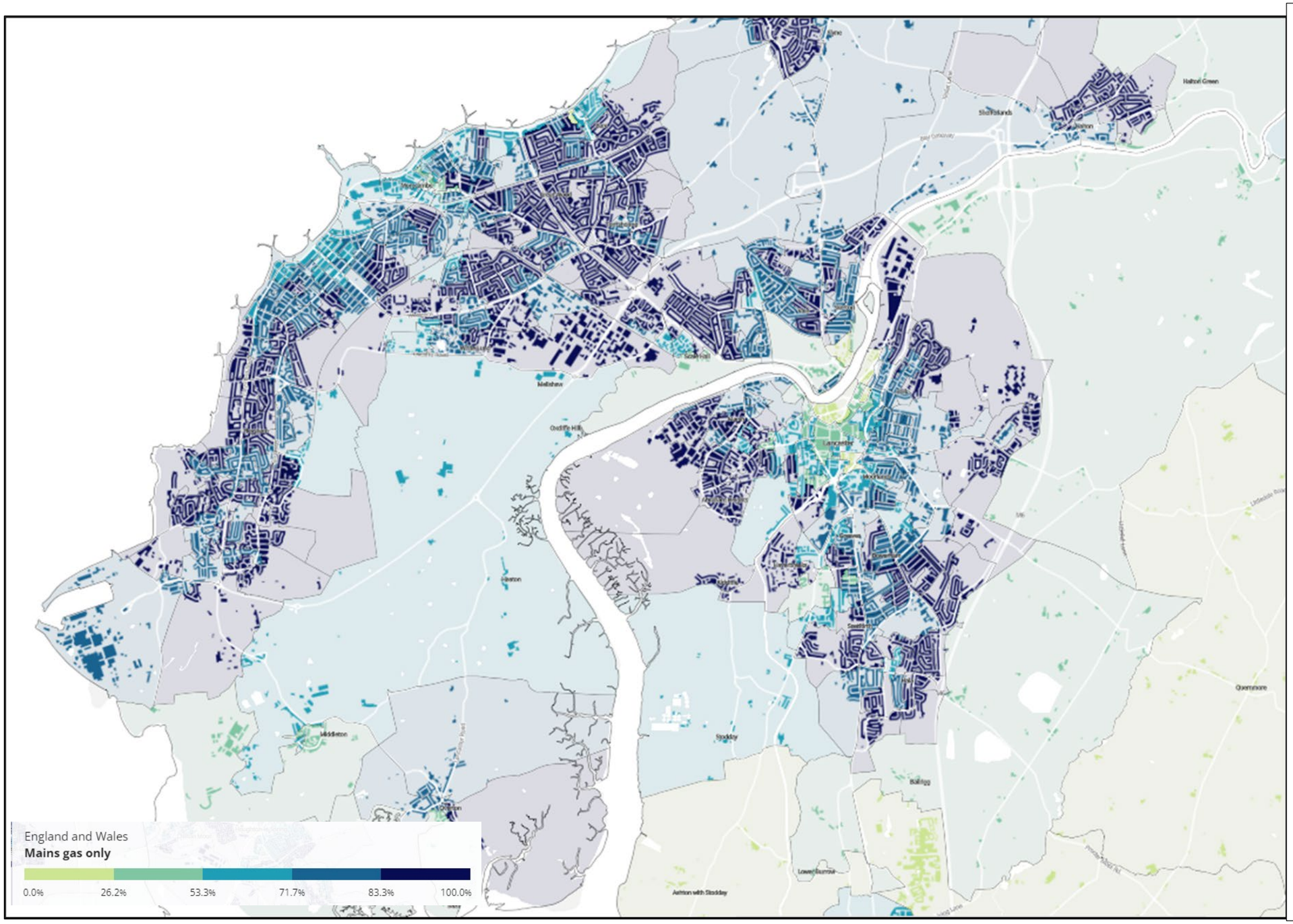
Map D

Existing Heat Networks

E. Physical Constraints



F. Off-Gas Grid Areas in Lancaster



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.

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 18: 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 19: Pilot Programme Study-Area-Specific Information Resources

Information resource	Description of resource
Local Plan, Planning Library and Strategies	The Development Plan Documents which make up the Local Plan.

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.