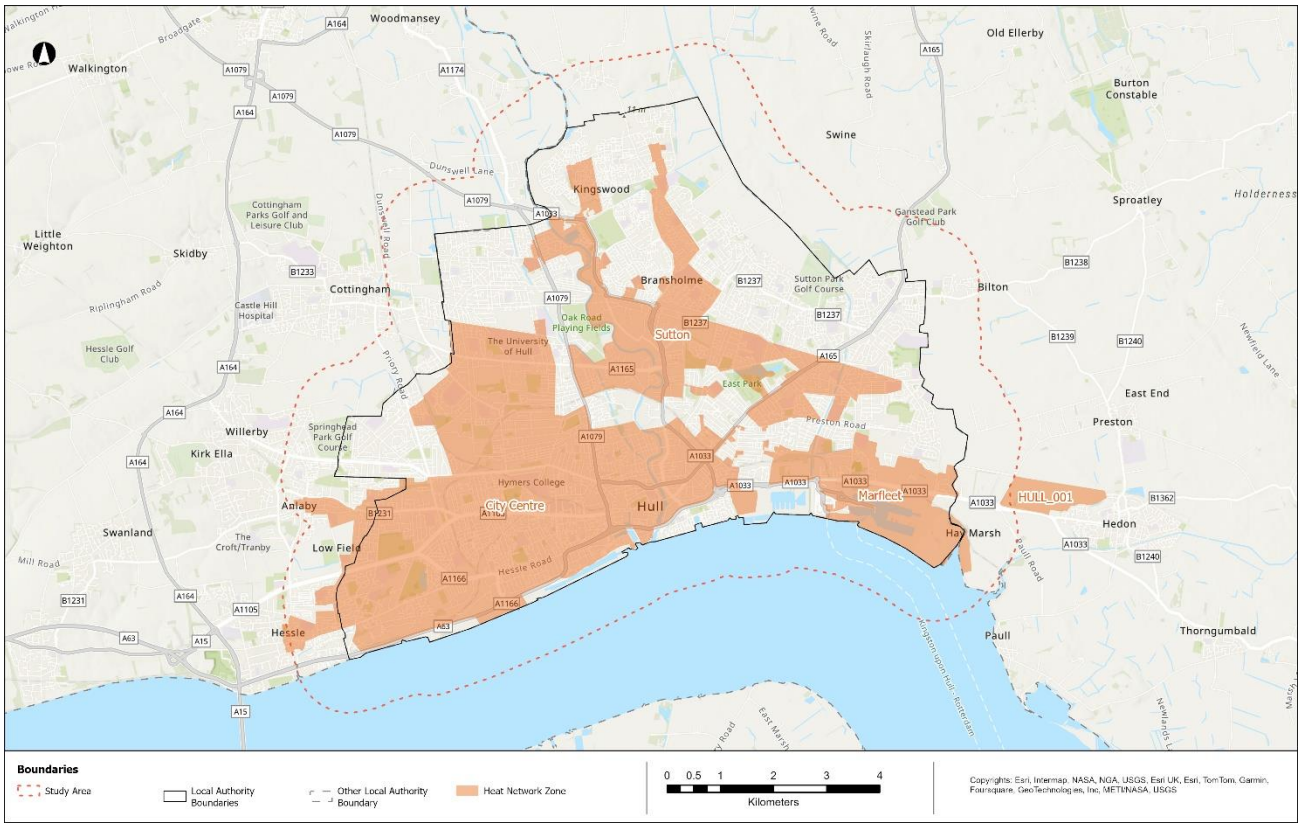
Department for Energy Security & Net Zero

Hull

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 Hull: Hull, officially known as Kingston upon Hull, is a key port city in East Yorkshire, England, with a population of approximately 260,000. It has a diverse history as a market town, trading centre, and major manufacturing industrial hub.

Local Energy Policy: Hull City Council committed to reaching Net Zero. The Hull 2030 Carbon Neutral Strategy includes developing a heat network in Hull City Centre, with the first phase commencing in 2025.

Existing heat networks: Hull City Council recently received funding from the Green Heat Network Fund to design and launch the city's first district heating network.

Zones identified: A total of four heat network zones were identified in Hull. The overall heat demand for all the buildings required to connect within these zones is around 650GWh/yr.

Strategic heat network zones: Three strategic zones were identified in Hull City Centre, Marfleet and Sutton. The overall heat demand for all buildings required to connect within these strategic zones is around 650GWh/yr.

Key heat demands: The initial zone opportunities identified would connect about 300GWh/yr of heat. Key buildings include Princes Quay shopping centre, and other commercial, industrial and public sector buildings.

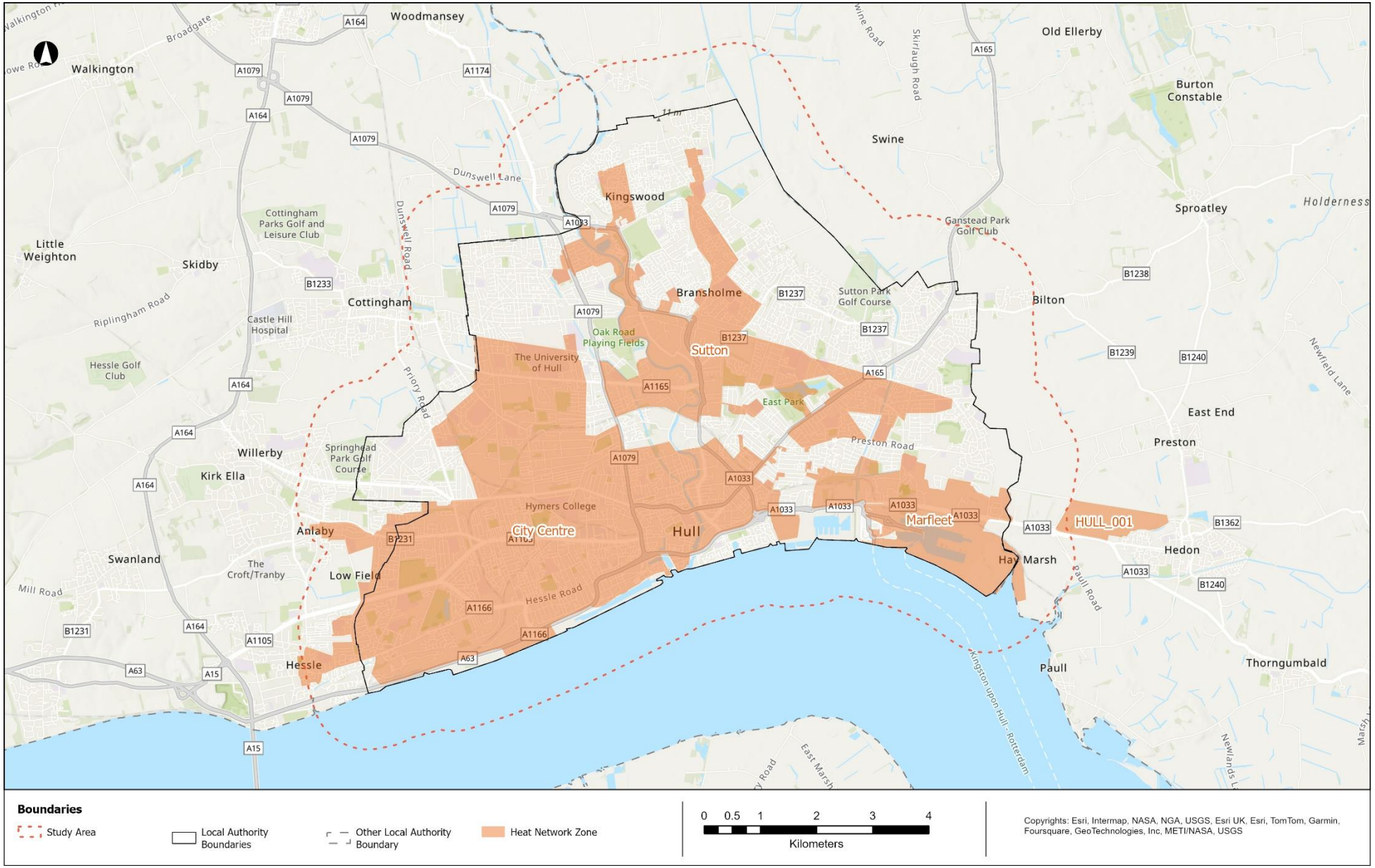
Key heat sources: Potential heat sources include water source heat pumps, air source heat pumps, and heat recovery from an energy recovery facility.

Estimated CapEx: The high-level estimate of capital expenditure to network all buildings required to connect in all zones is approximately £900m, of which the initial zone opportunities amount to approximately £425m.

Other heat network zones: Smaller heat network zones identified in Hull include the Yorkshire Energy Park heat network zone, which is the UK's first freeport-based energy and technology business park.

Carbon savings: The initial zone opportunities identified could deliver carbon savings of more than 50ktCO_{2e} annually.

Figure 1: Overview of Heat Network Zones in Hull



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 Hull 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.

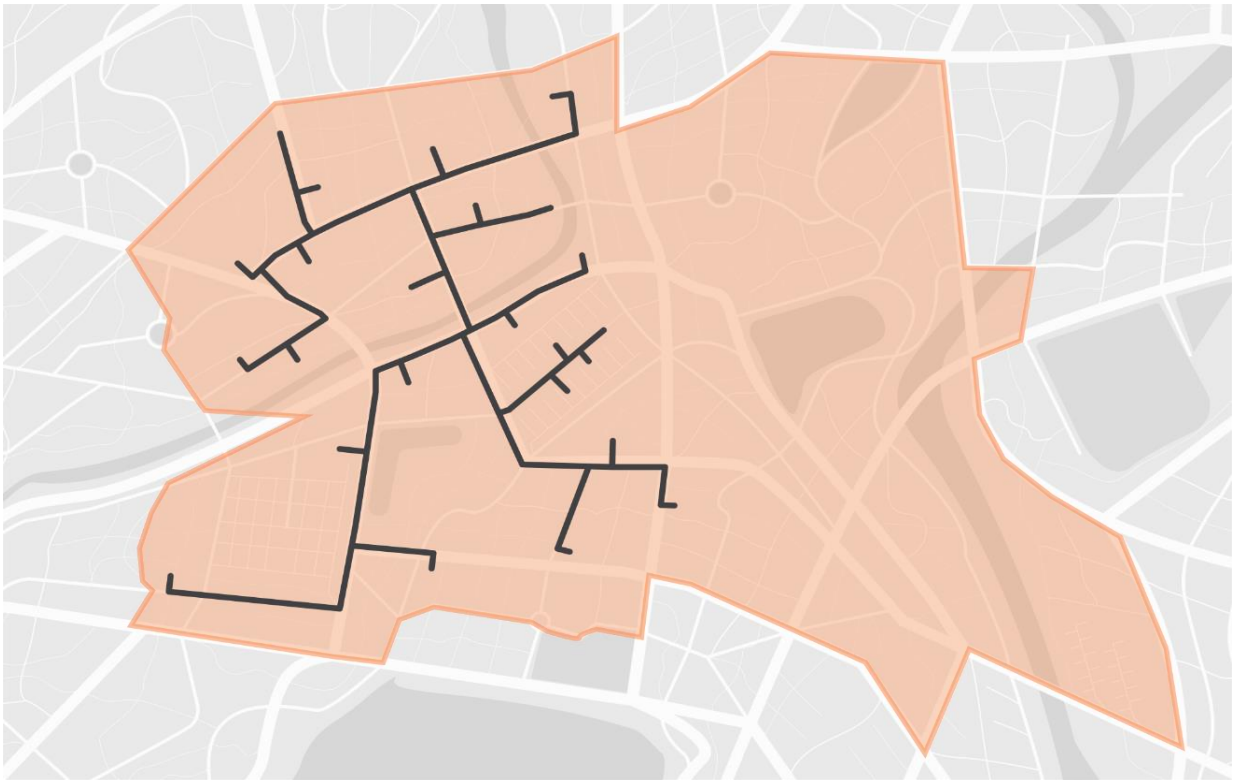
[1] More information can be found in the Heat Network Zoning Methodology Statements (Appendix 3, 4 & 5)

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.

2) Hull Heat Networks Context

2.1) Hull City Overview

Hull, officially known as Kingston-Upon-Hull, is a key port city and unitary authority area sitting on the River Hull in east Yorkshire, England. A major regional city, Hull stretches over 71.5km^2 and is home to a population of approximately 260,000 making it the fourth largest city in the Yorkshire-Humber region.

The city's location on both the River Hull and the Humber Estuary has ensured a diverse history. Through 800 years of maritime history, Hull has changed with the times and has been a market town, trading centre, and has now evolved into a major industrial hub with manufacturing accounting for 24% of the city's productivity. The city is also home to Europe's largest wind turbine manufacturing plant which has created over 2,000 jobs in the renewable sector.

Hull City Council (HCC) has a strong ambition to be a leading carbon neutral city, the successful achievement of which will help secure the economic and social benefits of a carbon neutral economy. HCC has committed to be carbon neutral by 2030 and has taken strong action and created thorough strategies to achieve this.

HCC has taken a range of actions on climate mitigation and adaptation to date. It has set standards in flood infrastructure with a £42m project giving Hull a reputation as a leading flood adapted city. Furthermore, Hull has delivered leading projects for efficient LED street lighting and is in the process of developing Council-owned onshore wind turbines as well as establishing an energy research centre via strategic partnerships with the University of Hull.

2.2) Hull Net Zero Targets and Commitments

Hull is a leader in city and regional climate action. In March 2019, HCC declared a climate emergency due to the irreversible effects of climate change and rising sea levels threatening the city.

HCC conducted a survey in June 2019 which found 77% of all residents considered climate change as a threat and further accepted that current plans and actions were not sufficient to achieve the targets set out by the Paris Agreement at COP21 (2015). To address this, in 2020 Hull committed to be carbon neutral by 2030 through their Hull 2030 Carbon Neutral Strategy[3].

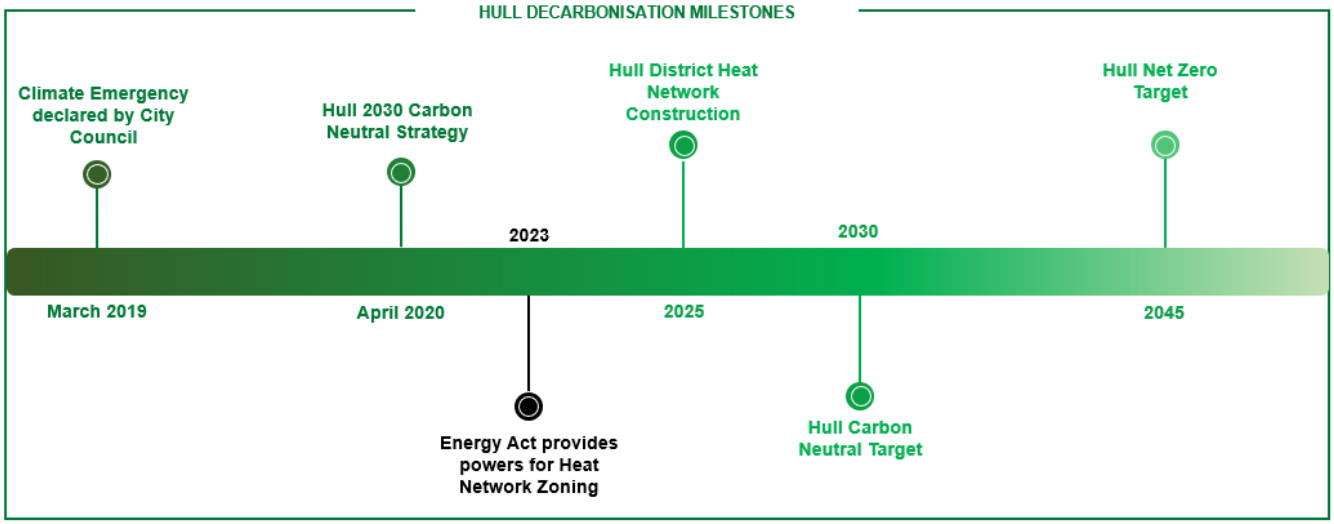
The strategy has an eight-pronged approach representing interlinking themes which set out points of focus and core challenge areas for activity in Hull. Energy occupies two of the eight themes as 'Heat' and 'Power'.

[3] Hull City Council (2019). Hull 2030 Carbon Neutral Strategy – Hull. [online] Hull. Available at: https://www.hull.gov.uk/net-zero/hull-2030-carbon-neutral-stategy

The decarbonisation of heat in Hull presents the greatest challenge to the 2030 Carbon Neutral Strategy. The strategy confirms that in 2017 the gas consumption for the domestic and non-domestic sectors respectively was 1,340GWh and 1,012GWh. Acknowledging the importance and challenge of heat decarbonisation, HCC included local and regional commitments to incorporate heat network infrastructure as part of their net zero strategies as well as undertaking fabric first approaches to improve energy efficiency across the city. In addition to this HCC further approved the formation of the Hull District Heat Network with construction aimed to begin in 2025 (see Section 2.3).

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

Figure 3: Hull Decarbonisation Milestones



2.3) Delivering Heat Networks in Hull

Hull does not have any district-scale heat network infrastructure at present, however, in 2022, HCC were awarded £13m from the UK government's Green Heat Network Fund to design and launch the city's first district heating network.

The network has an expected CAPEX cost of £40m and will provide low-carbon heat to buildings in the city centre from a bespoke energy centre. The project is expected to commence during 2025 with a projected date of operation in 2026. The proposed network plans sit within the City Centre HNZ.

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

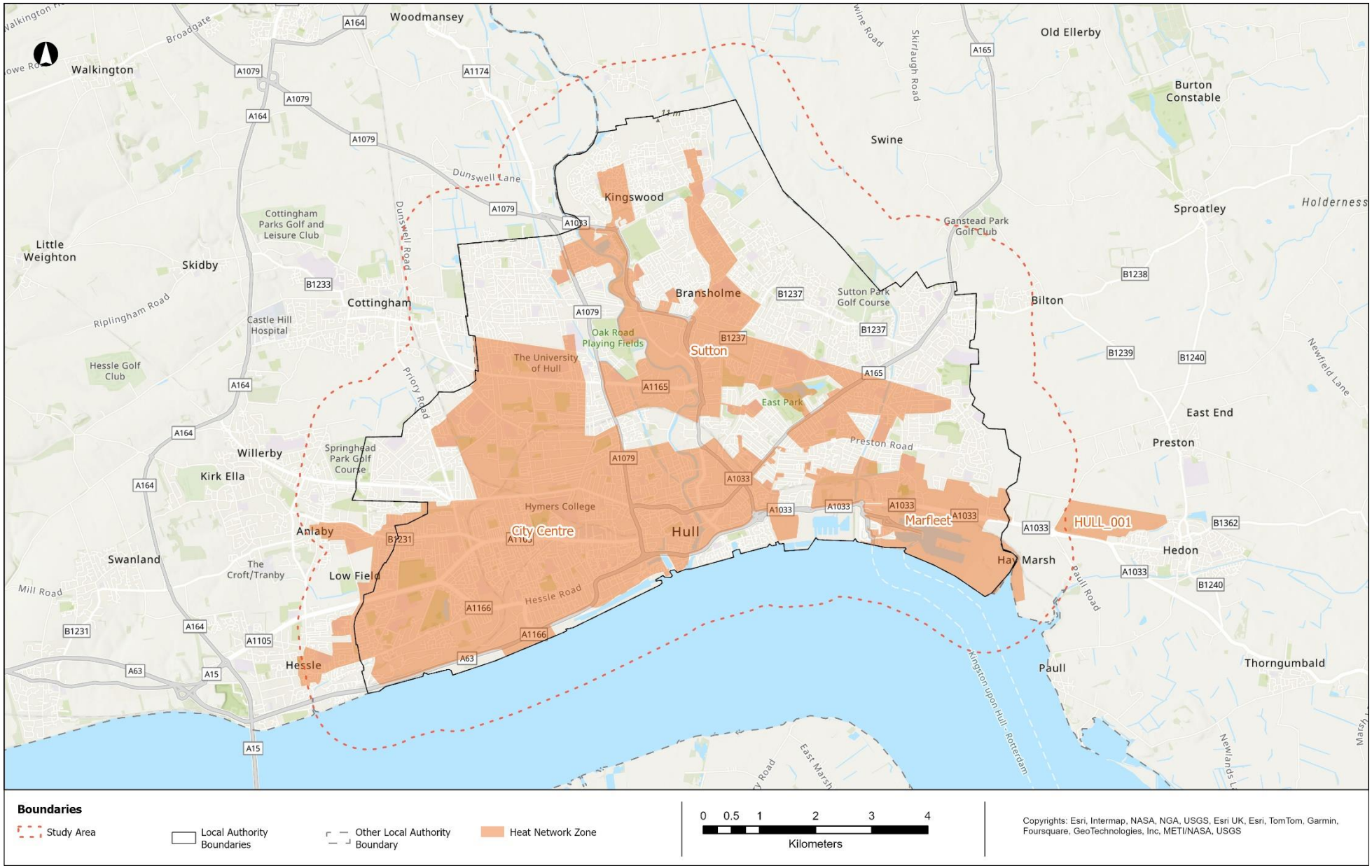
2.4) Hull Heat Network Zones

A total of four potential HNZs were identified in Hull, with three considered Strategic HNZs. Figure 4, below, shows the study area boundary as well as the boundaries of all HNZs identified within Hull. 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.

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



3) Strategic Heat Network Zones

Strategic HNZs in Hull

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 Hull. 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[4]	650
All buildings required to connect in strategic zones	650
All buildings connected to the IZOs	300

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 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 required to connect.

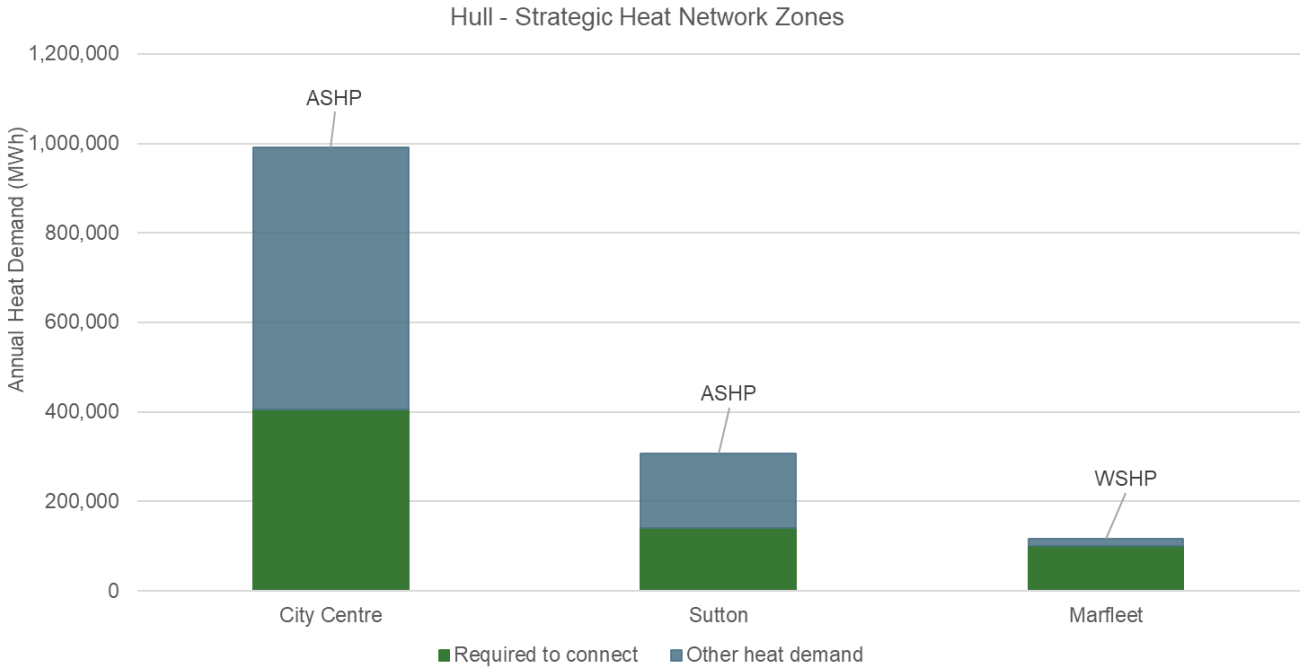
City Centre is a Strategic HNZ located in the centre of the city mainly composed of the general areas of Northern, Wyke, West, and Riverside. Characteristic of a typical city centre the typology is a dense urban environment and is dominated by non-domestic sectors such as retail and office use. For more information, please see Section 3.1.

[4] 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.

Marfleet is a Strategic HNZ located to the east of the city centre. The HNZ is home to a major international seaport and as such heat demand from this HNZ is mainly from the non-domestic industrial sector. For more information, please see Section 3.2.

Sutton is a Strategic HNZ north of both Hull city centre and Marfleet HNZs. The HNZ covers the main areas of Kingswood, Bransholme, and Sutton-on-Hull. The major contributors to heat demand in this area are industrial and retail buildings. For more information, please see Section 3.3.

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



3.1) Hull City Centre

3.1.1) Hull City Centre – HNZ Summary

Hull City Centre is the largest strategic zone in the city. It is in the centre of Hull and encompasses an area of 24.7km^2. It is a dense urban area with a high number and concentration of buildings potentially required to connect.

The heat demand in this zone is dominated by the retail sector which constitutes approximately 43% of total connected heat demand. Approximately 1,000 buildings in the zone have been identified as buildings that may be required to connect. Potential anchor heat loads include the Princes Quay Shopping Centre as well as the Paragon Station Offices.

The River Hull, a key feature in the city flows through the zone. Alongside air source heat pumps (ASHPs) and heat recovery from the Energy Works Energy Recovery Facility (ERF), the river provides an opportunity for water source heat pumps (WSHPs) to be utilised as a key low carbon heat source for a heat network. The density of buildings as well as the availability of

heat via WSHP on the river demonstrates the strength and high potential of this zone for the development of heat networks.

3.1.2) Hull City Centre - Existing Heat Networks

There is one planned heat network in Hull. At the time of writing, it is understood that another network is being developed in Hull East, but this is not described here (see Appendix 1: Map D).

Planned Heat Networks – Late stage

Hull District Heat Network

The Hull District Heat Network is a key component of HCC's Carbon Neutral 2030 Strategy and has received £13m funding from the Green Heat Network Fund. Phase 1 is expected to start construction in 2025. Key figures relating to this heat network are summarised in Table 2.

Table 2: Hull City Centre - Summary statistics for Planned heat networks[5]

Annual Demand	Heat Sources	Estimated CapEx	Construction Start Date
23.3GWh	Bespoke energy centre	£40m	2025

3.1.3) Hull City Centre - Initial Zone Opportunities

A single IZO was identified in the Hull City Centre zone. Potential routing[6] for the IZO is shown in Figure 6 and summary statistics provided in Table 3.

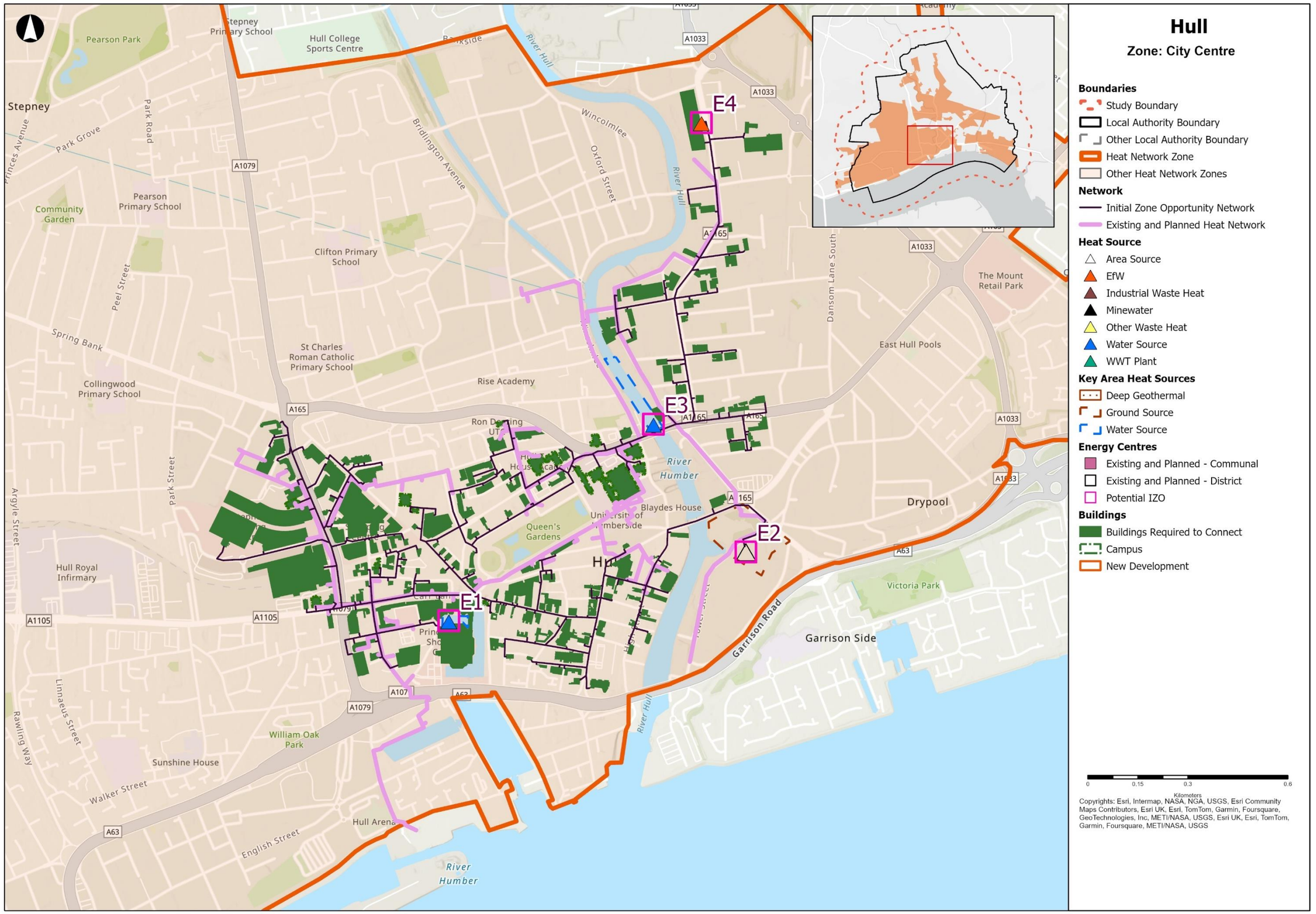
Table 3: Hull City Centre - Summary Statistics for Initial Zone Opportunities[5]

CapEx	Heat	Network	CO_{2e} savings	Linear Heat Density	Heat Sources
>£175m	>100GWh/yr	>13km	>15ktCO_{2e}/yr	8.8MWh/m	ASHP, WSHP, ERF

The identified IZO is in the centre of Hull and covers a large portion of the urban centre with the A63 road forming the IZO's southern border. The size is driven by the high heat demand and existing plans for heat network development in the area. It is estimated that the IZO could supply more than 100GWh/yr of low carbon heat to over 250 buildings that may be required to connect. It is proposed that the IZO is served by four main heat sources including two WSHPs, an ASHP, and heat provided from an ERF.

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

Figure 6: Initial Zone Opportunities in Hull City Centre HNZ



3.1.4) Hull City Centre – IZO Heat Demands

The heat demands identified within the IZO 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.

A breakdown of heat demand per building typology is presented below, followed by the largest heat demands that may be required to connect (see Figure 7 and Table 4). The IZO in the City Centre connects over 250 existing buildings with an overall heat demand of over 100GWh/yr. The heat demand is dominated by the non-domestic sector, with the public sector forming much of the remaining demand. It is anchored by the Princes Quay Shopping Centre in the south and extends north to the Energy Works site. The retail sector is the most dominant, occupying 5 of the top 10 largest heat demands. This is followed by the industrial sector and non-domestic sectors respectively.

Figure 7: Hull City Centre - Categorisation of Heat Demand for Buildings Required to Connect in IZOs

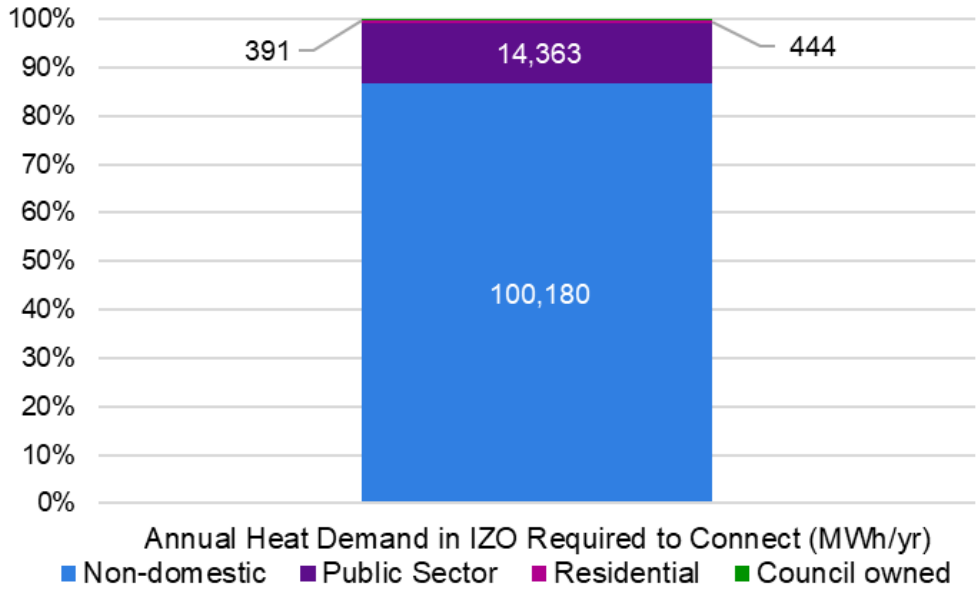


Table 4: Hull City Centre - Key Heat Demands Required to Connect in the IZO[7]

Building name	Building category	Number of connections	Annual Heat Demand (MWh)	Data Source
Princes Quay Shopping Centre	Non-domestic (Office)	3	12,650	Benchmark (NZM)
Paragon Station	Non-domestic	15	10,500	DEC
Energy Works	Non-domestic (Retail)	1	5,200	Benchmark (NZM)
British Homes Store	Non-domestic (Retail)	1	3,150	Benchmark (NZM)
Hammonds of Hull	Non-domestic (Catering)	Unknown	1,850	Benchmark (NZM)
Ferens Art Gallery	Public Sector	1	1,800	Metered
Finlay Hull Ltd	Non-domestic (Industrial)	1	1750	Benchmark (NZM)
Holy Trinity Parish Church	Public Sector	1	1,150	Benchmark (NZM)
Carr Lane	Non-domestic (Industrial)	2	900	DEC
St Stephen's Shopping Centre	Non-domestic (Retail)	Unknown	300	Metered

3.1.5) Hull City Centre – IZO Heat Sources

Table 5 and Table 6 summarise the key heat sources and potential energy centre locations identified. These are also shown in Figure 6 in Section 3.1.3 above and in Appendix 1: Map C.

The opportunity to recover heat from the River Hull using a WSHP has been promoted as one of the main options to develop and expand heat networks in the City Centre HNZ. ASHPs are also included as a heat source together with heat from the ERF.

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

Table 5: Hull City Centre - Key Heat Source Opportunities for the IZO

Heat source type	Supplied Capacity (kWp)	Temperature (ºC)	Potential Energy Centre (Ref number)
WSHP	9,000	50-75 ºC[8]	E1
ASHP	12,000	30-70 ºC[8]	E2
WSHP	9,000	50-75 ºC[8]	E3
ERF	800	70-90 ºC[8]	E4

Table 6: Hull City Centre - Potential IZO Energy Centre Locations

EC Ref number	Site type	Size (m^2)	Ownership	Heat Source
E1	Quay	900	HCC	WSHP
E2	Land	1200	HCC	ASHP
E3	River	900	HCC	WSHP
E4	Land	80[9]	Energy Works	ERF

3.1.6) Hull 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.

The development of the City Centre IZO is mainly focused on the dense urban area close to the River Hull. The network follows the A1079 and A1105 roads to connect to the anchor loads

[8] The temperature at which heat will be distributed to heat offtakers, after upgrade processes
[9] Energy centre size required assumed 100m^2/MW. Additional surveys are recommended to support approximation.

of St Stephens and Princes Quay Shopping Centres. The network also crosses the river via two crossings: the Drypool and North bridges. Table 7 below, shows the network statistics for the City Centre IZO including the network length and associated cost. Please see Appendix 5 for related methodology statements and assumptions.

Table 7: Hull City Centre - Indicative Heat Network Statistics for the IZO

IZO Heat Network description	Network length (km)	Network cost (£m)
Hull City Centre	13	55

3.1.7) Hull City Centre – IZO Key Constraints and Mitigations

All identified risks and constraints can be seen in Appendix 1: Map E, and the key physical barriers for the IZO are summarised below.

[C9] River crossings: The proposed network route runs on both sides of the River Hull which necessitates two crossings. These crossings are at the Drypool Bridge and North Bridge. Both bridges are ‘open bridges’ and therefore cannot support pipework across their span. Despite this, pipework can be constructed underneath or across the riverbed and a feasibility study would be required to further investigate this.

3.2) Marfleet

3.2.1) Marfleet – HNZ Summary

Marfleet is a strategic HNZ located to the east of Hull City Centre. It covers an industrial area including a major UK port, the Port of Hull. It stretches from the Humber Estuary in the south, crossing Holderness Drain, to HM Prison Hull in the east, and reaches to just before Preston Road in the north.

Over 100 buildings were identified as potentially required to connect with a total heat demand of approximately 100GWh/yr. The key anchor loads are mainly from the non-domestic industrial sector such as Willerby Ltd and Finnelines Ltd.

The zone's southern border sits directly on the Humber and as such can be utilised as a key heat source via a WSHP. Another key feature is the close location to Saltend Power Station and the Old Fleet Drain where an ASHP and WSHP have been proposed as heat sources. The high demand and density of this HNZ as well as its strategic location along the Humber demonstrate a high potential for heat network development.

3.2.2) Marfleet - Existing Heat Networks

No existing district-scale heat networks have been identified in the proposed zone.

3.2.3) Marfleet – Initial Zone Opportunities

A single IZO was identified in the Marfleet zone. Potential routing[10] for the IZO is shown in Figure 8 and summary statistics provided in Table 8.

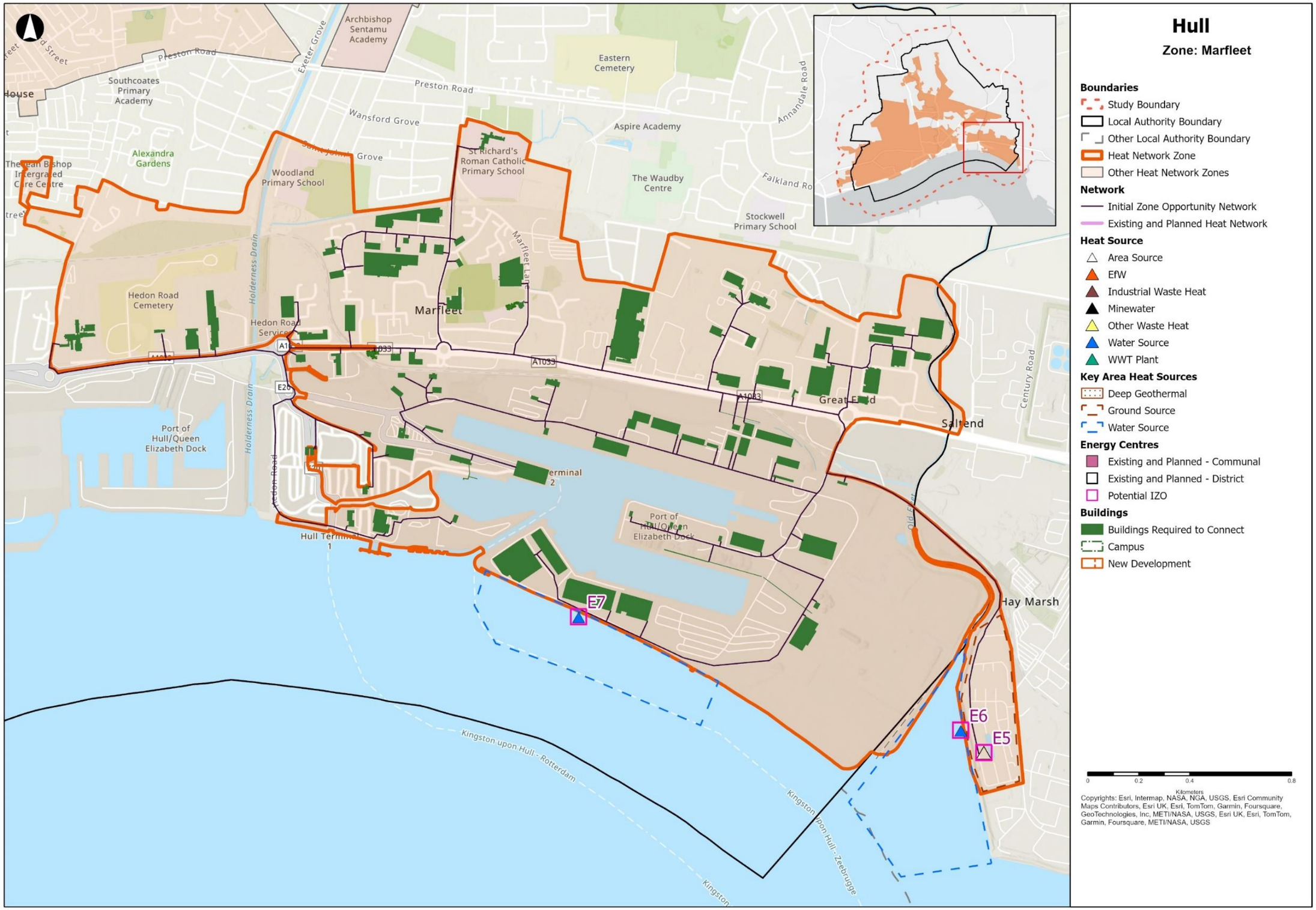
Table 8: Marfleet - Summary Statistics for Initial Zone Opportunities[11]

CapEx	Heat	Network	CO_2e savings	Linear Heat Density	Heat Sources
~£125m	~100GWh/yr	>18km	~15ktCO_{2e}/yr	5.1MWh/m	ASHP & WSHP

The identified IZO occupies the entire footprint of the HNZ, determined by several factors including the number of buildings potentially required to connect and the availability of heat supply. The IZO is estimated to supply around 100GWh/yr of low carbon heat to over 100 buildings potentially required to connect. The main heat sources identified were WSHPs and ASHPs.

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

Figure 8: Initial Zone Opportunity in Marfleet HNZ



3.2.4) Marfleet – IZO Heat Demands

A breakdown of heat demand per building typology is presented below, followed by the largest heat demands that may be required to connect (see Figure 9 and Table 9).

The IZO in Marfleet connects over 100 buildings with an overall heat demand of around 100GWh/yr[12]. The heat demand is made up entirely of existing non-domestic and public sector buildings. It is anchored at the south by the largest contributor to heat demand in the zone – Finnelines. The northernmost connection in this IZO is St Richard's Roman Catholic School. The largest buildings potentially required to connect are a mixture of industrial buildings and offices, with the only exception a Ministry of Justice (MoJ) building.

Figure 9 Marfleet - Categorisation of Heat Demand for Buildings Required to Connect in IZO

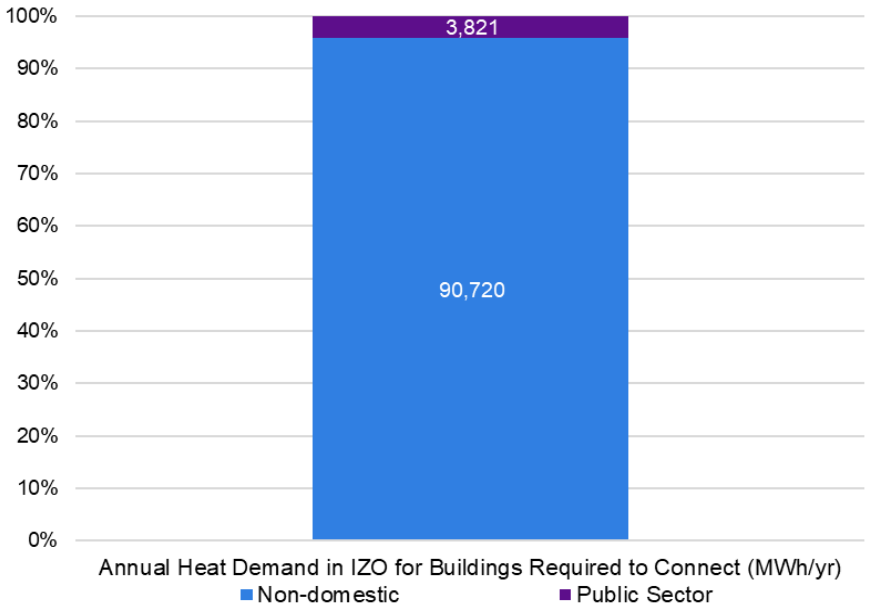


Table 9: Marfleet - Key Heat Demands Required to Connect in the IZO[13]

Building name	Building category	Number of connections	Annual Heat Demand (MWh)	Data Source
Finnlines UK Ltd	Non-domestic (Office/Industrial)	3	10,900	Benchmark (NZM)
Willerby Ltd, Imperial House	Non-domestic (Industrial)	1	6,300	Benchmark (NZM)
Walker Modules Ltd, Sumitomo Building	Non-domestic (Industrial)	1	3,500	Benchmark (NZM)

[12] Please refer to section 3.1.4 for a description of IZO heat demands.
[13] 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
HM Prison Hull	Public Sector	Unknown	3,450	MoJ National Dataset
Unicorn Trading Park	Non-domestic (Industrial)	3	3,300	Benchmark (NZM)
NW Trading Ltd	Non-domestic (Office)	1	3,000	Benchmark (NZM)
J H Fenner Holdings Ltd	Non-domestic (Industrial)	1	2,950	Benchmark (NZM)
Kingspan Access Floors Ltd	Non-domestic (Industrial)	1	2,750	Benchmark (NZM)
King George Dock Steel Terminal 10	Non-domestic (Office)	1	2,600	Benchmark (NZM)
King George Dock, Shed 8 / Northern Gateway	Non-domestic (Office)	1	2,200	Benchmark (NZM)

3.2.5) Marfleet – IZO Heat Sources

Table 10 and Table 11 summarise the key heat sources and potential energy centre locations identified for the IZO. These are also shown in Figure 8 in Section 3.2.3 above and in Appendix 1: Map C. The main heat sources within the IZO are WSHPs and ASHPs.

Table 10: Marfleet - Key Heat Source Opportunities for the IZO

Heat source type	Supplied Capacity (kWp)	Temperature (ºC)	Potential Energy Centre (Ref number)
WSHP			
River	9,200	50-75 ºC[14]	E7
River	9,000	50-75 ºC[14]	E6
ASHP	6,500	30-70 ºC[14]	E5

[14] The temperature at which heat will be distributed to heat offtakers, after upgrade processes

Table 11: Marfleet - Potential IZO Energy Centre Locations

EC Ref number	Site type	Size (m^2)[15]	Ownership	Heat Source
E6	Building	900	Triton Power	ASHP
E7	River	900	Public	WSHP
E8	River	650	Public	WSHP

3.2.6) Marfleet – IZO Heat Distribution

Table 12 shows the network statistics for the IZO including the network length and associated costs. Please refer to Section 3.1.6 and Appendix 5 for the assumptions used. The Marfleet IZO covers a significant part of the zone, with connections proposed across the entire zone. The proposed network route encompasses the entire port area and follows the A1033 to enable connection to the northern portion of the zone.

Table 12: Marfleet - Indicative Heat Network Statistics for the IZO

IZO Heat Network description	Network length (km)	Network cost (£m)
Marfleet	18	60

3.2.7) Marfleet – IZO Key Constraints and Mitigations

All identified risks and constraints can be seen in Appendix 1: Map E and the key physical barriers for the IZO are summarised below.

[C10] Drain crossing: The proposed network route includes a single drain crossing. This crossing aligns with the existing road and bridge infrastructure, but a feasibility study is required to assess the possibility of utilising the existing road bridges over the drain.

[C4] Rail crossing: The proposed network route crosses under a small section of the local port railway line to the east of the IZO. Crossing of this railway will require consultation with the rail operator and a study to evaluate the feasibility of this crossing under the railway considering its active use for the Port of Hull.

[15] Energy centre size required assumed 100m^2/MW. Additional surveys are recommended to support approximation.

3.3) Sutton

3.3.1) Sutton – HNZ Summary

Sutton is a Strategic HNZ located north of Hull City Centre. It covers a large suburban area with a strong industrial and educational presence. In total, 260 buildings have been identified as buildings that may be required to connect.

The zone stretches from Preston Road in the south to Kingswood in the north, with its furthest points being Oakfield School and Thomas Ferens Academy in the east and west respectively. The River Hull is present within the zone and partially forms its boundary.

3.3.2) Sutton - Existing Heat Networks

No existing district-scale heat networks have been identified in the proposed zone.

3.3.3) Sutton – Initial Zone Opportunities

A single IZO was identified in the Sutton zone. Potential routing[16] for the IZO is shown in Figure 10 and summary statistics provided in Table 13.

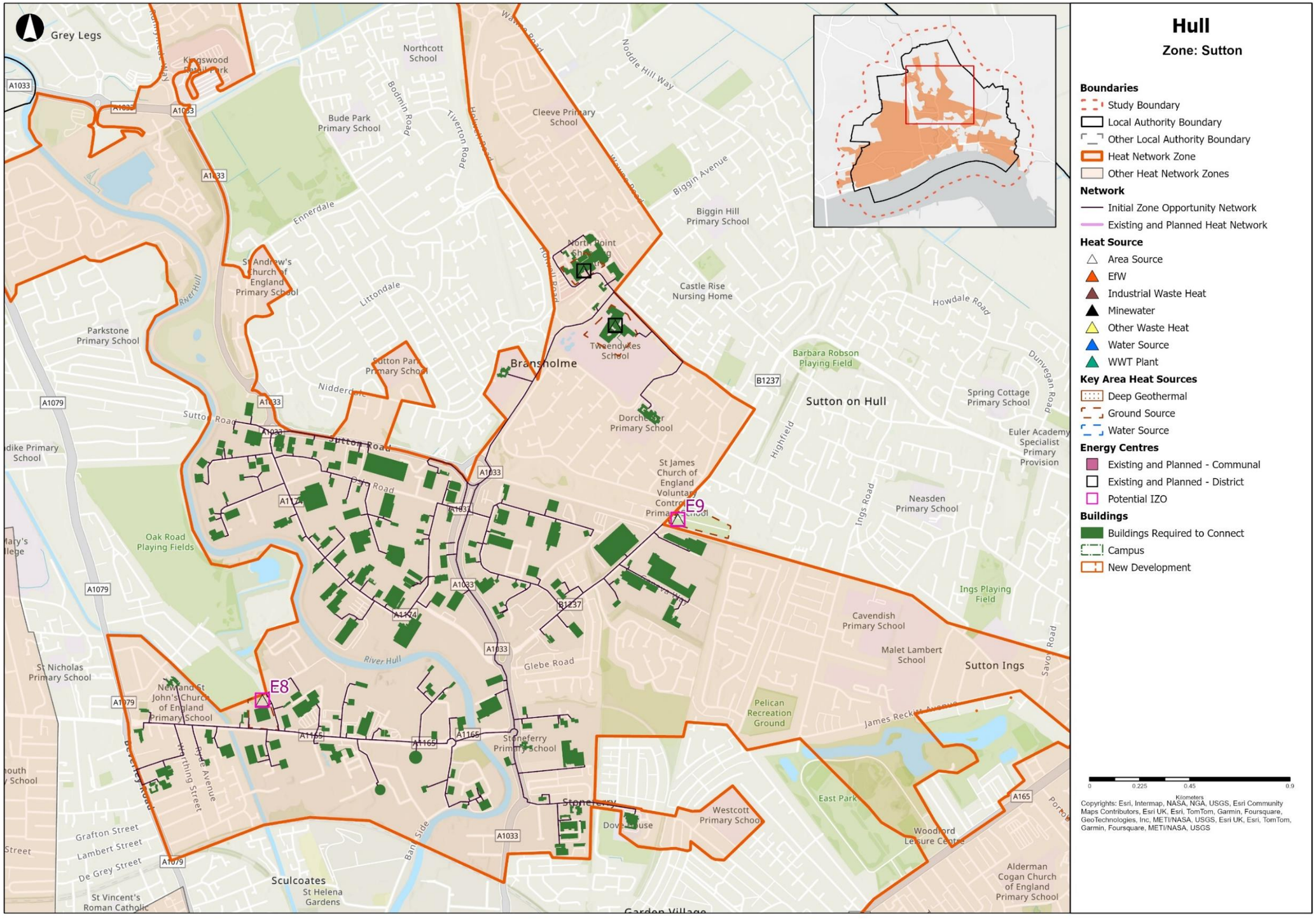
Table 13: Sutton - Summary Statistics for Initial Zone Opportunities[17]

CapEx	Heat	Network	CO_{2e} savings	Linear Heat Density	Heat Sources
~£150m	>100GWh/yr	>22km	~15ktCO_{2e}/yr	4.6MWh/m	ASHPs

The identified IZO occupies the centre of the zone, determined by several factors including the high number of buildings potentially required to connect as well as several potential heat sources. The IZO runs for more than 22km connecting nearly 190 buildings with a total heat demand of over 100GWh/yr.

[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 10: Initial Zone Opportunity in Sutton HNZ



3.3.4) Sutton – IZO Heat Demands

A breakdown of heat demand per building typology is presented below, followed by the largest heat demands that may be required to connect (see Figure 11 and Table 14).

The IZO in Sutton connects to 189 buildings with a total heat demand of over 100GWh/yr. Much of the heat demand[18] is represented by the non-domestic sector, with a significant portion of demand from the public sector and a lesser amount from the residential sector. The IZO anchored in the north by the North Point Shopping Centre and Tweendykes School and extends both south and west towards Stoneferry and St John's Church respectively. The largest individual heat demands are dominated almost entirely by the industrial sector with Tweendykes Academy being the only non-industrial building featuring in the list.

Figure 11: Sutton - Categorisation of Heat Demand for Buildings Required to Connect in IZO

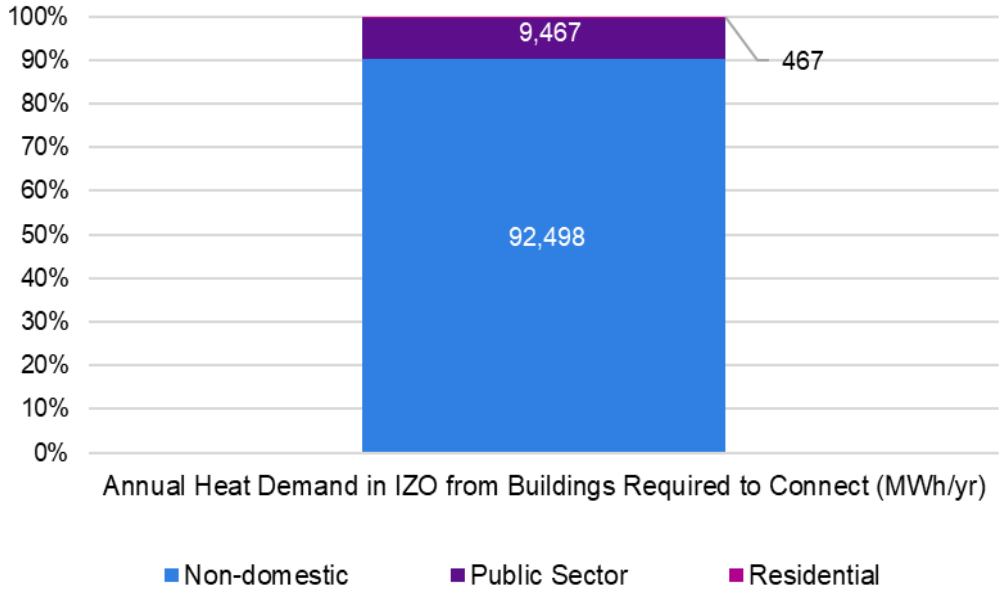


Table 14: Sutton - Key Heat Demands Required to Connect in the IZO[19]

Building category	Building name	Number of connections	Annual Heat Demand (MWh)	Data Source
Bericap Ltd Building	Non-domestic (Industrial)	1	5,000	Benchmark (NZM)
Kingstown Furnishings	Non-domestic (Industrial)	1	3,300	Benchmark (NZM)

[18] Please refer to section 3.1.4 for a description of IZO heat demands.
[19] Please refer to Appendix 3 for definitions related to building categories in this table.

Building category	Building name	Number of connections	Annual Heat Demand (MWh)	Data Source
Donaldson Filter Components Ltd	Non-domestic (Industrial)	1	3,000	Benchmark (NZM)
Lazenbys	Non-domestic (Industrial)	1	2,400	Benchmark (NZM)
Tweendykes Academy	Public Sector	1	2,100	DEC
Cranswick Foods Ltd	Non-domestic (Industrial)	1	2,000	Benchmark (NZM)
Delta Caravans	Non-domestic (Industrial)	1	1,800	Benchmark (NZM)
Daifuku Logan Ltd	Non-domestic (Industrial)	1	1,800	Benchmark (NZM)
Greencore Cake & Desserts	Non-domestic (Industrial)	1	1,050	DEC
Robert McBride Ltd	Non-domestic (Industrial)	1	950	DEC

3.3.5) Sutton – IZO Heat Sources

Table 15 and Table 16 summarise the key heat sources and potential energy centre locations identified. They are also shown in Figure 10 Section 3.3.3 above and in Appendix 1: Map C. The main heat sources within the IZO are ASHPs.

Table 15: Sutton - Key Heat Source Opportunities for the IZO

Heat source type	Supplied Capacity (kWp)	Temperature (ºC)	Potential Energy Centre (Ref number)
ASHP	12,000	30-70 ºC[20]	E8
ASHP	1,200	30-70 ºC[20]	E8
ASHP	12,000	30-70 ºC[20]	E9
ASHP	1,800	30-70 ºC[20]	E9

[20] The temperature at which heat will be distributed to heat offtakers, after upgrade processes

Table 16: Sutton - Potential IZO Energy Centre Locations

EC Ref number	Site type	Size (m^2)	Ownership	Heat Source
E8	Land	1,300m^2	HCC	ASHP
E9	Land	1,400m^2	HCC	ASHP

3.3.6) Sutton – IZO Heat Distribution

Table 17 shows the network statistics for the IZO including the network length and associated costs. Please refer to Section 3.1.6 and Appendix 4 for the assumptions used.

The Sutton IZO occupies a significant part of the wider Sutton zone. The main spines of the proposed network follow the A1165 and the A1033 roads northwards towards Bransholme where there are two proposed energy centres.

Table 17: Sutton - Indicative Heat Network statistics for the IZO

IZO Heat Network description	Network length (km)	Network cost (£m)
Sutton	22	95

3.3.7) Sutton – IZO Key Constraints and Mitigations

All identified risks and constraints can be seen in Appendix 1: Map E, and the key physical barriers for the IZO are summarised below.

[C9] River crossing: There is a single river crossing on the proposed network route. Despite the existing road infrastructure, an open bridge is the only means of an above ground crossing and therefore pipework may need to be constructed underneath or across the riverbed and a feasibility study would be required to further investigate this.

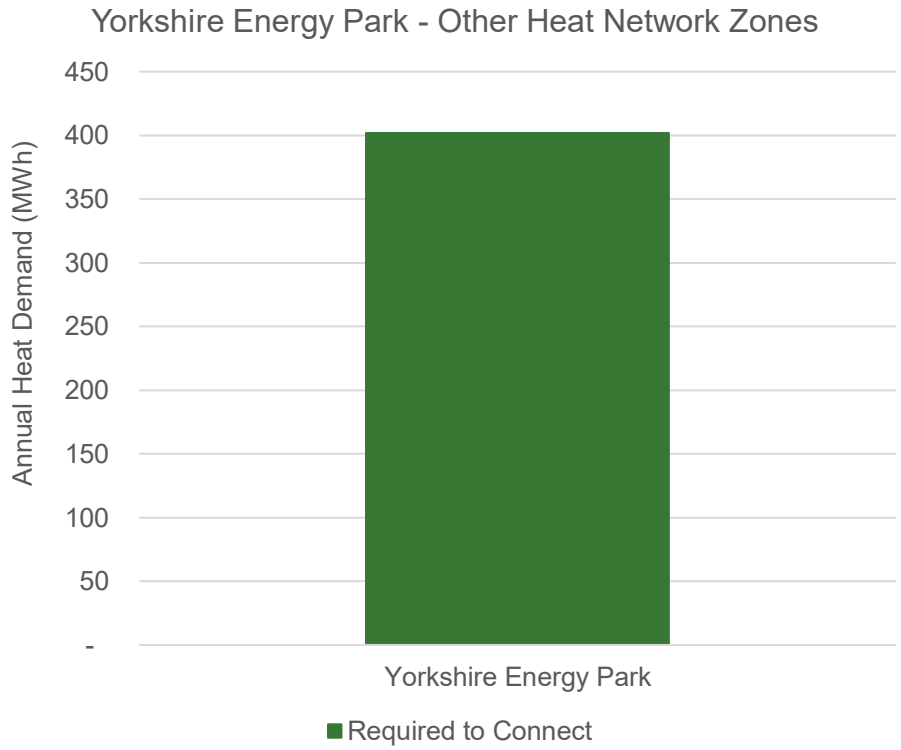
[C11] Drain crossing: The proposed route crosses the Beverly and Barmston Drain. This crossing also follows the existing road infrastructure, and the drain is abridged by a permanent structure. A study is required to evaluate the feasibility of crossing the drain along the current structure.

4) Other Heat Network Zones

This section describes the 'Other' potential heat network zones that were identified in Hull. 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 required to connect within each zone. A map of all zones can be found in Figure 4.

Figure 12: Total Heat Demand and Proportion Required to Connect in Other HNZs



Yorkshire Energy Park (Hull_1): is situated east of the city centre, a short distance from the Marfleet HNZ. It is not considered strategic due to the site being under development with only three buildings currently present, all of which may be required to connect. The Yorkshire Energy Park is located on a former aerodrome site spanning 212 acres. The proposed development is expected to host a range of building typologies including education and sport facilities, energy infrastructure, business spaces and a data centre.

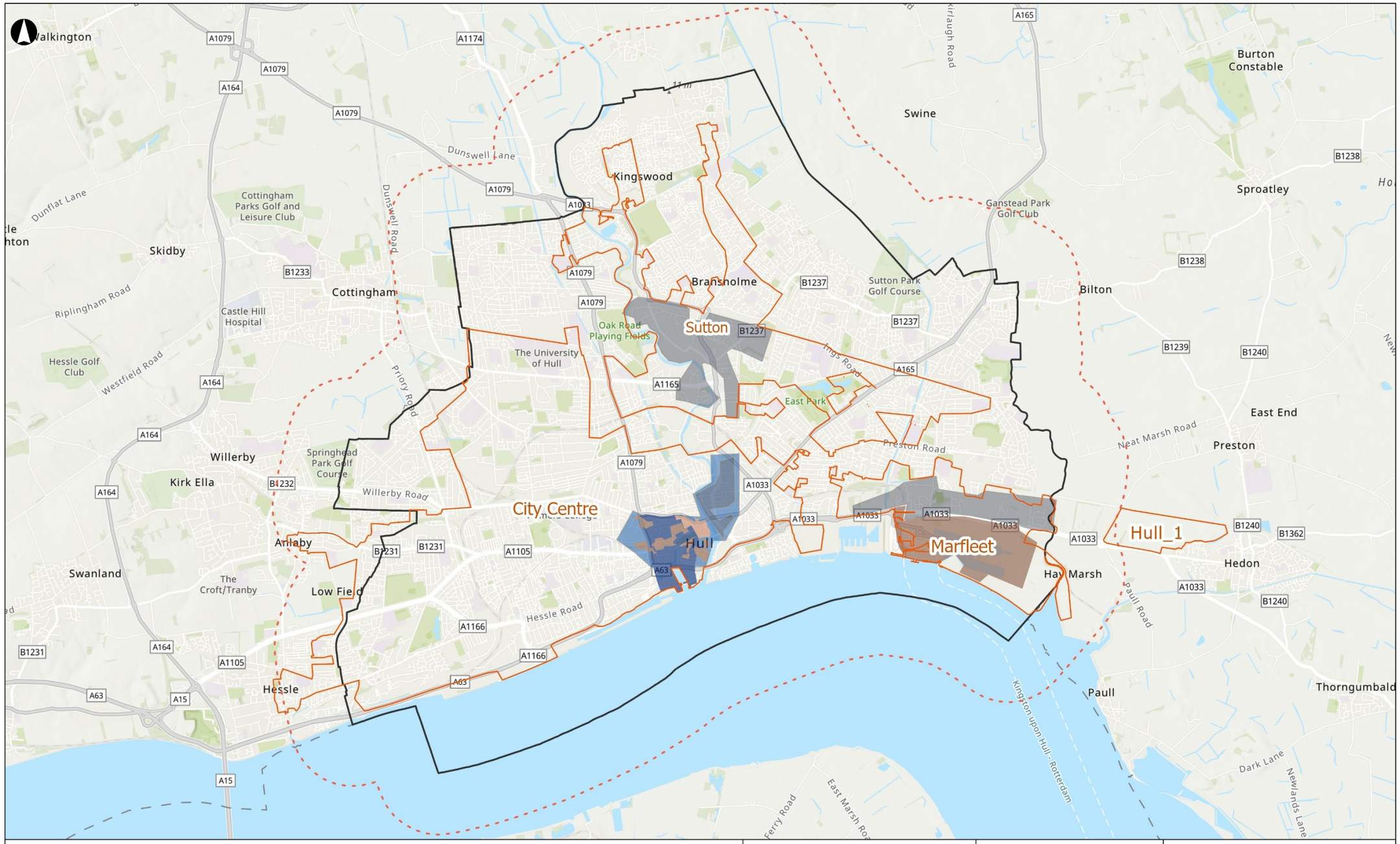
Appendix 1 – Maps and Legends

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. Hull 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

0 0.75 1.5 3
Kilometers

Scale: 1:58,000

Coordinate System: British National Grid

Department for Energy Security & Net Zero

Hull

Map A

City Typologies

B. Key Heat Demands

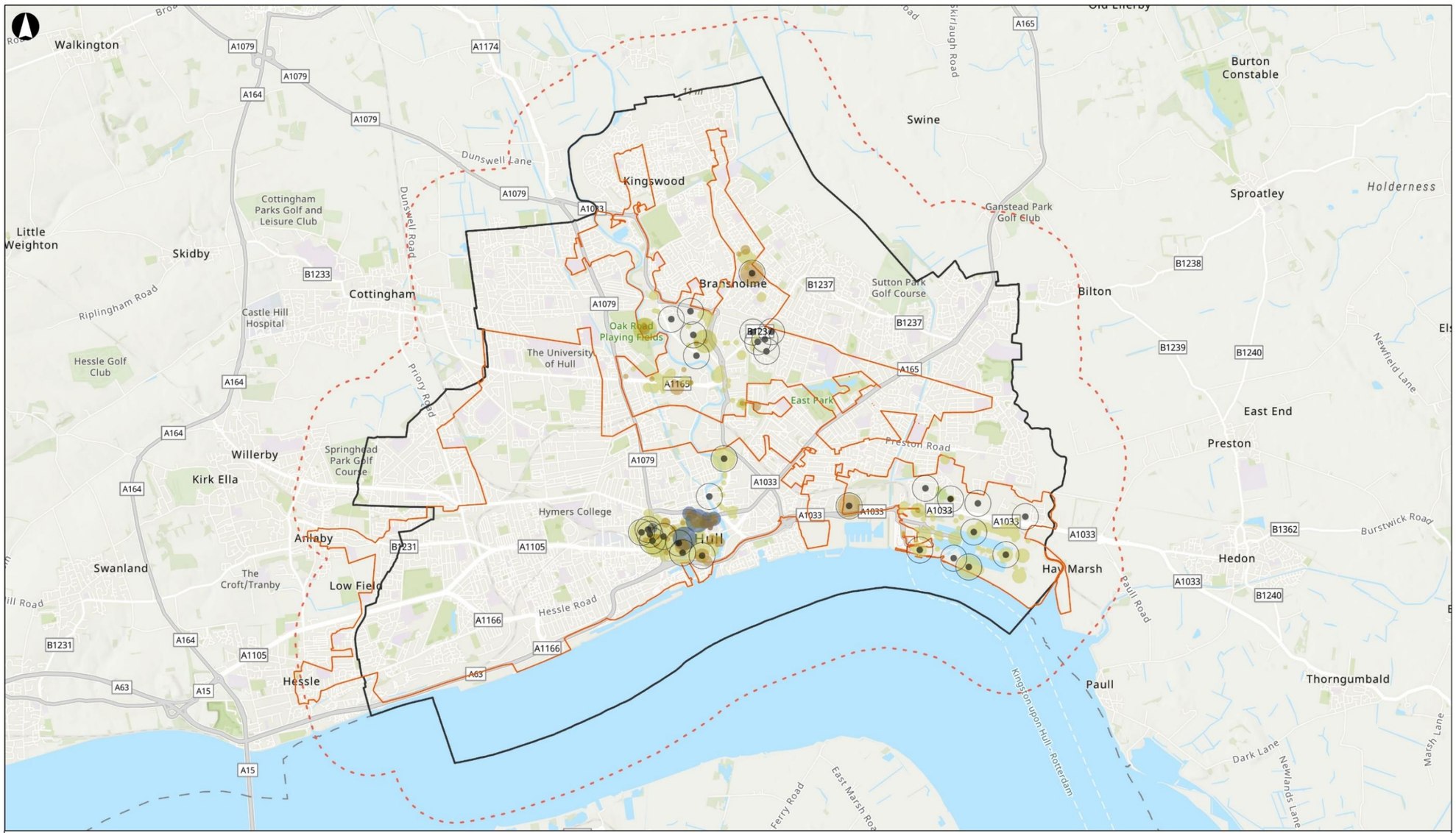
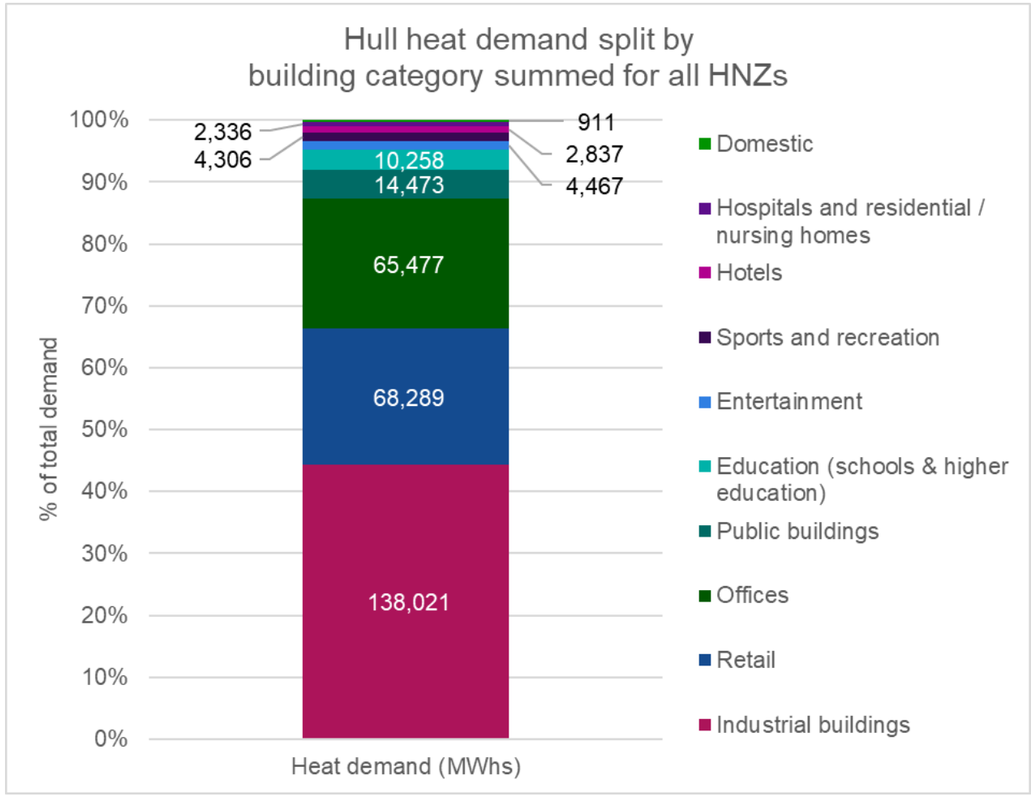


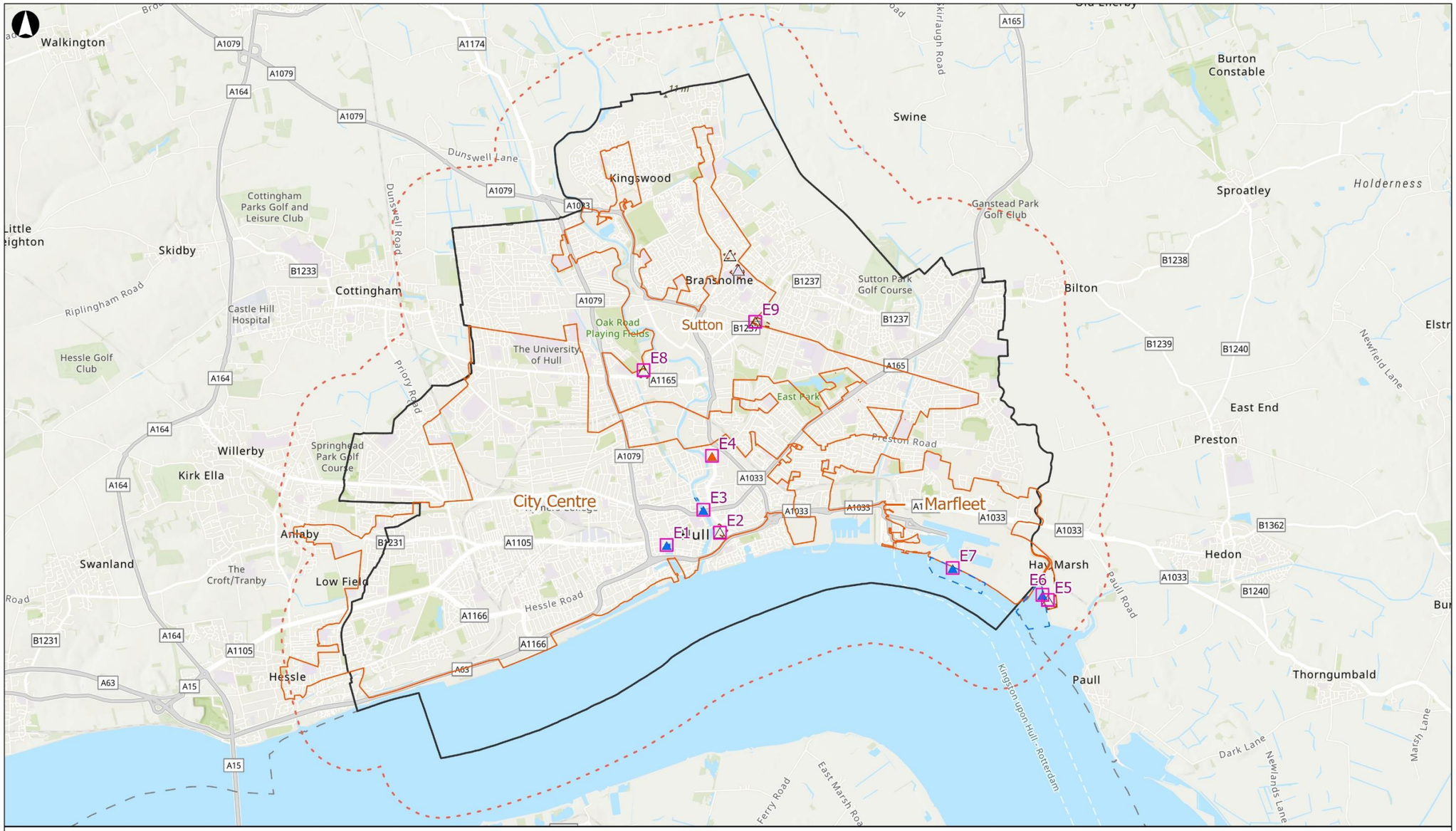
Table 18: Heat Demand split further by Building Categories across all Initial Zone Opportunities identified in Strategic HNZs in the Study Area

Building category	Annual Heat Demand of buildings required to connect across IZOs (MWh)
Industrial buildings	138,021
Retail	68,289
Offices	65,477
Public buildings	14,473
Education (schools & higher education)	10,258
Entertainment	4,467
Hotels	2,837
Hospitals and residential / nursing homes	2,336
Sports and recreation	4,306
Domestic	911
Totals	**311,375**



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

C. Key Heat Sources and Potential Energy Centres



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

Key Area Heat Sources
- Deep Geothermal or Coal Minewater
- Ground Source
- Water Source

Heat Source
- Area Source
- EfW
- Industrial Waste Heat
- Minewater
- Other Waste Heat
- Water Source
- WWT Plant

Capacity (GWh/year)
- 0 - 2
- 2 - 4
- 4 - 6
- 6 - 8

Energy Centres
- Potential IZO

0 0.75 1.5 3
Kilometers

Scale: 1:62,000
Coordinate System: British National Grid

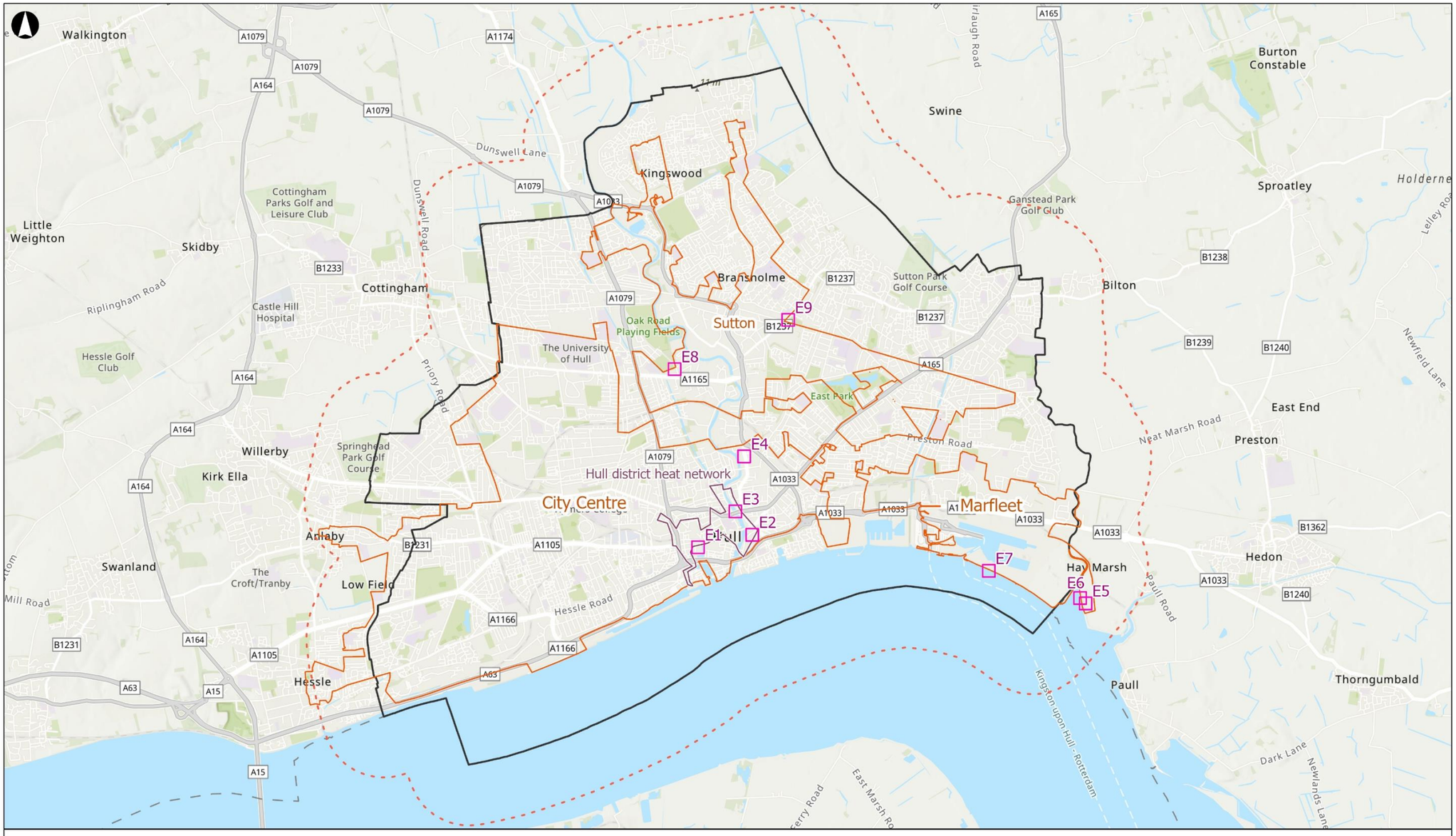
Department for Energy Security & Net Zero

Hull

Map C

Key Heat Sources and 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 0.75 1.5 3
Kilometers

Scale: 1:61,000

Coordinate System: British National Grid

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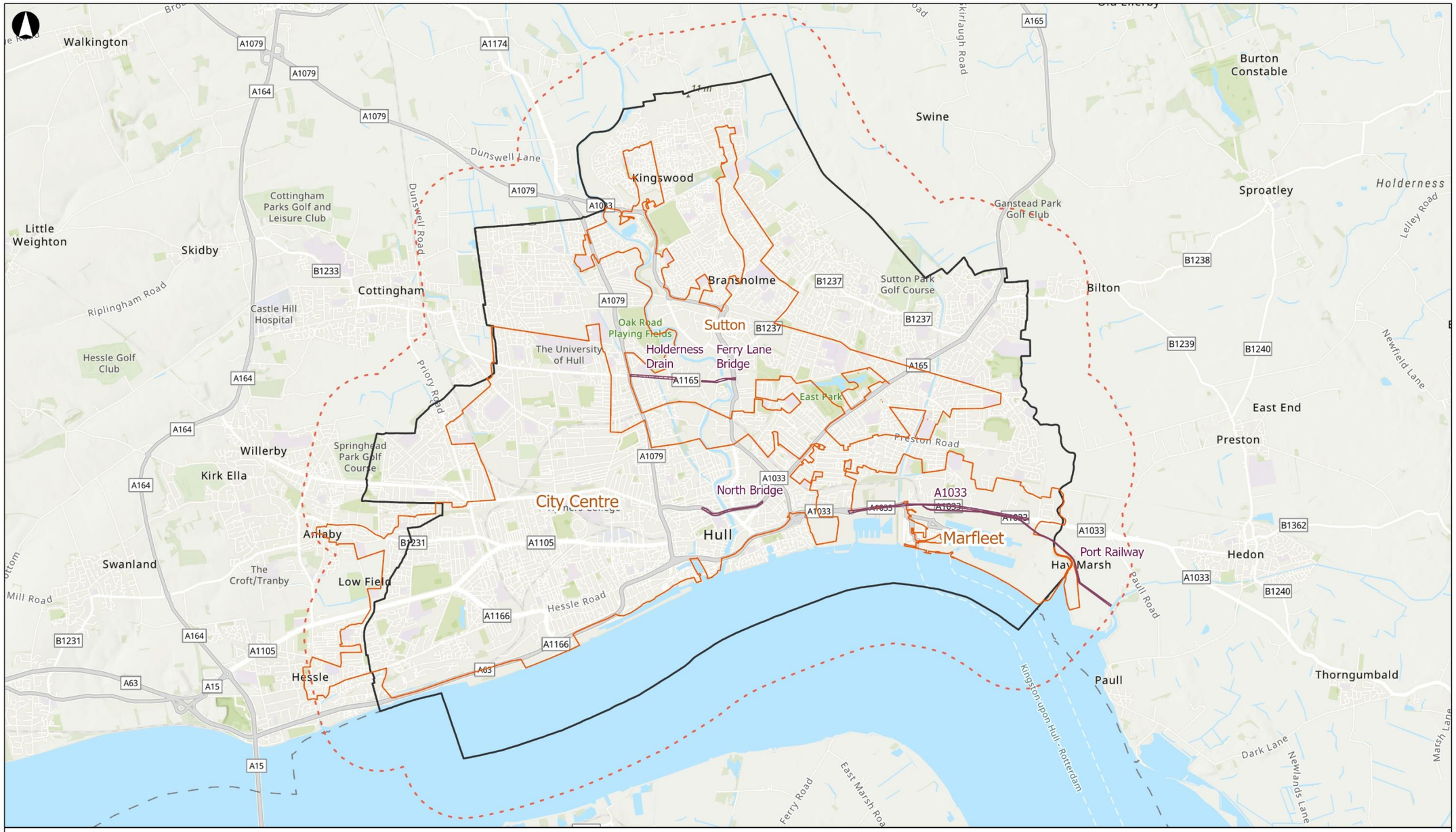
Map D

Existing Heat Networks

E. Physical Constraints



Boundaries

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

Key Constraints

0 0.75 1.5 3
Kilometers

Scale: 1:62,000

Coordinate System: British National Grid

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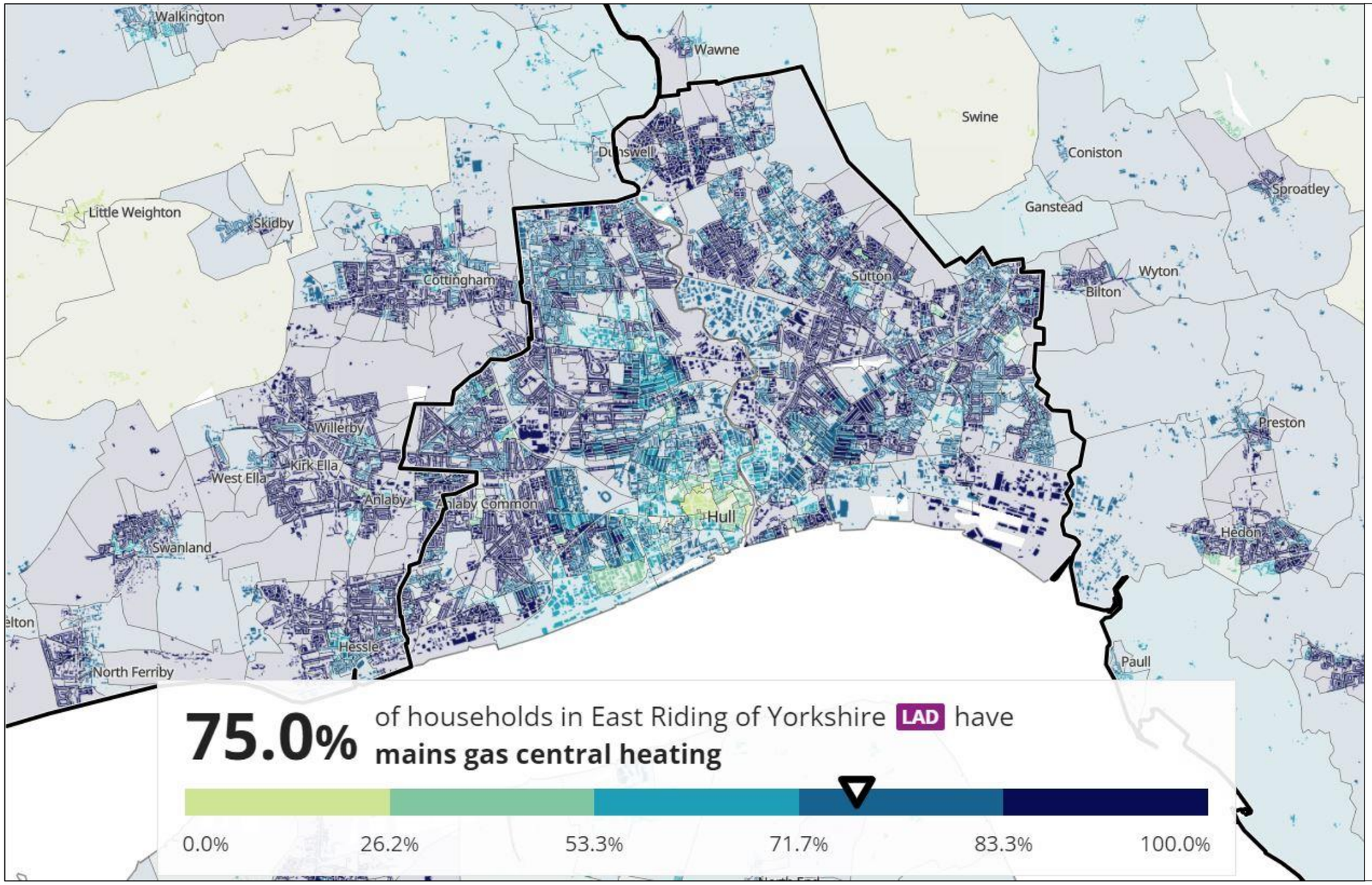
Hull

Map E

Physical Constraints

F. Off-Gas Grid Areas in Hull



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 19: 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 20: Pilot Programme Study-Area-Specific Information Resources

Information resource	Description of resource
2015 Ramboll Masterplanning	Heat map data
Heat Profiles of Hull City Centre	Heat profiles of key buildings in Hull City Centre

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.