

Hackney Heat Mapping Study



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1. Introduction

1.1. Background

AECOM has been commissioned by the London Borough of Hackney to carry out a heat mapping exercise of the Borough as part of the London Development Agency's (LDA) Decentralised Energy Master Planning (DEMaP) programme.

The DEMaP programme is part of the strategy to meet the Mayor's target for 25% of London's energy supply to come from decentralised energy by 2020 and is responsible for the development of the web based London Heat Map.

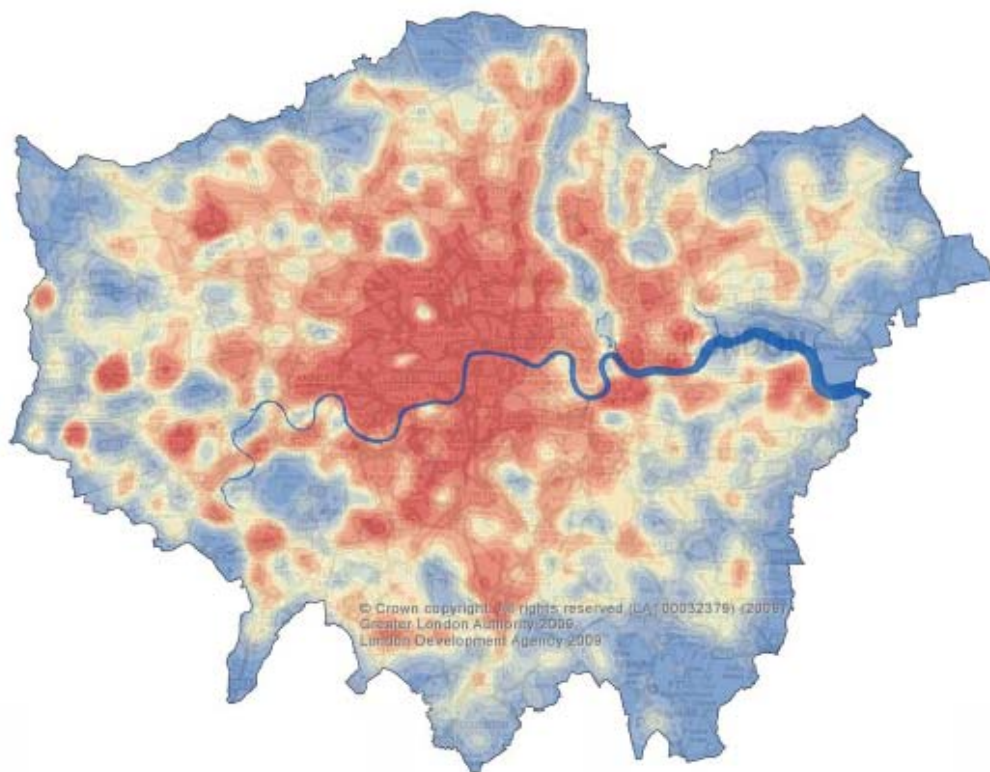


Figure 1: London Heat Map (courtesy of LDA)

The London Heat Map is currently mostly based on estimated energy data and the aim is to improve the accuracy of the map by replacing the estimated data with actual metered data wherever possible. In order to achieve this, the LDA has made available some funding for Boroughs to gather actual energy data and identify sites with potential for district heating (DH) networks within their boundaries. The London Borough of Hackney was successful in securing this funding and has appointed AECOM to carry out the work.

The heat mapping study is only phase 1 of the LDA's strategy to support Boroughs in promoting decentralised energy systems. Further funding will be made available for two more phases on successful application by the boroughs. The second phase, *Tranche 1*, will focus on carrying out a feasibility study and delivery and procurement strategies for the site(s) identified after phase 1 as having the highest potential for district heating. Phase 3, the *Implementation Stage* will focus on the financial, legal and procurement options available for the delivery of the preferred site.

1.2. Content of this report

This report summarises the methodology and outcomes of the heat mapping exercise carried out for the London Borough of Hackney and it includes:

- Details of the data sources used and methodology of data collection
- Graphical representation of data gathered
- Methodology used for data analysis
- List of priority sites and implementation plan

2. Data collection

The brief required the data to be collected in an Excel spreadsheet template provided by the LDA. The spreadsheet allowed the data to be easily uploaded into GIS and used to update the London Heat Map. The template required the following information:

Major heat loads:	Existing district heating networks:	Major heat supply plants:
- OS grid references - Name and address of site - Ownership of building - Whether the building is proposed or existing - Type and age of building - Type of heating system and fuel - Fuel consumption (MWh/year) - Gross internal floor area - Installed capacity (thermal and electrical where combined heat and power [CHP] is present) - CO₂ emissions associated with fuel consumption (tCO₂/year) - For new development – construction start and completion year - Year of data collection - Data source - Confidentiality of data	- OS grid references - Name and address of energy centre site - Ownership of building - Fuel source - Length of trench - Type of heating system and fuel - Fuel consumption (MWh/year) - Installed capacity (thermal and electrical where combined heat and power is present) - CO₂ emissions associated with fuel consumption (tCO₂/year) - For new development – construction start and completion year - Year of data collection - Data source - Confidentiality of data	- OS grid references - Name and address of site - Ownership of building - Whether the building is proposed or existing - Type of plant - Fuel source - Fuel consumption (MWh/year) - Installed capacity (thermal and electrical where combined heat and power is present) - CO₂ emissions associated with fuel consumption (tCO₂/year) - For new development – construction start and completion year - Year of data collection - Data source - Confidentiality of data

Table 1: Data requirements for LDA template

The aim was to collect as much of this information as possible, from as many buildings as possible. Given the wide scope of this exercise and the short timescale available, the search prioritised large buildings that are likely to have high heating loads. Public buildings were of particular interest as they are required to lead the way in terms of energy improvements and therefore are more likely to provide anchor loads for district heating networks than private buildings.

The search focused on the following building types:

- Hospitals
- Central government estate
- Local government estate (including social housing)
- Sport & leisure facilities
- Prisons
- Hotels

- Educational facilities
- Museums & art galleries
- Churches
- Private residential developments
- Private commercial developments
- Other public buildings (e.g. theatres, fire stations, police stations)

The focus was on collecting information about existing buildings, however data was also produced relating to proposed development. This is relevant due to the large quantum of development proposed in Hackney in the next few years and to the fact that it is much more cost effective to install district heating as part of the construction works than retrofitting.

2.1. Major heat loads - Existing buildings

Various institutions were contacted that were known to centrally collect energy consumption data for their estates. Other large individual buildings were identified looking at maps of Hackney and their occupiers were contacted directly to ask for their energy consumption data. Contact was made via phone and email and follow up calls were made over the 4 weeks that were assigned in the programme for data collection. The process was only partly successful as a considerable number of people contacted were not able to provide useful information within the required timescale.

Given below is a summary of the main institutions contacted and data obtained for the various building types listed above.

Building type	Contact	Data source
NHS	City & Hackney Teaching PCT Hospital Estates and Facilities Statistics	Hospital Estates and Facilities Statistics Display Energy Certificates Some metered data
Central Government Estate	n/a	Searched Borough but did not find any HMS Courts or other Central Government buildings within the Borough
London Borough of Hackney estates	LBH Facilities team	NI 185 data for civic buildings, schools, libraries and community buildings Energy bills for Hackney Homes housing estates
Sports and Leisure	Greenwich Leisure Limited	Metered data from LA leisure centres
Prisons	n/a	Searched Borough but did not find any HMS Prisons within the Borough
Hotels	Crowne Plaza Hotel, Shoreditch Holiday Inn Express, Old Street	Metered data

Educational facilities	LBH Facilities team Major private schools	NI185 data It was not possible to obtain metered data from private schools within the timescale
Museums & art galleries	Geffrye Museum Museum of London Archaeology	Metered data
Churches	Church of England Methodist Church	Church of England was interested in helping but could not provide useful data within the timescale ¹
Residential	Hackney Homes / LBH Facilities team Large private care home	It was not possible to obtain metered data from LBH housing estates and private care home within the timescale
Private commercial buildings	Tesco, Morrison, Iceland and others	Some metered data
Theatres and other public buildings	Hackney Empire, Arcola Theatre, Sutton House and others	It was not possible to obtain metered data within the timescale
Fire stations	London Fire Brigade	Some metered data, rest collected centrally by LDA
Police stations	Metropolitan Police	Collected centrally by LDA

Table 2: Summary of main data sources for existing buildings

It was not possible to source energy consumption data from Registered Social Landlords active in Hackney within the timescale of this project. This means that less than half of affordable housing in the Borough has been accounted for at this stage. If this data becomes available to LBH or the LDA at a later stage, it will be added directly onto the London Heat Map.

Similarly it was not possible to obtain data from the academies in the Borough, but contact has been made to try and source this. If the data becomes available at a later stage, it will be uploaded onto the London Heat Map directly by LBH.

The energy data provided for Hackney Homes estates included electricity consumption data. Most of this is associated with lighting and appliance use and therefore is outside the scope of this report. However some estates in the Boroughs have electric heating, therefore a proportion of the electricity consumption should be taken into account as part of this study.

The following estates were stated as having electric heating:

- Boscobel House
- Fields Estate
- Kingsgate Estate
- Lincoln Court
- Morland Estate

As the data did not differentiate between electricity used for space and water heating and electricity used for lighting and appliances, an assumption had to be made on what the split is likely to be. It was assumed that 65% of the total electricity consumption for the above estates was used for heating and hot water and therefore was included in the data collection template.

It may be that a proportion of the dwellings in other estates are served by electric heating, however there was no way of establishing this from the data set provided. It was also not possible to obtain this information by other means within the

¹ Note: it is worth the LDA contacting the Church of England directly to obtain energy data for all churches in London as the data is being collected as part of the Shrinking the Footprint campaign

timescale of the project. Therefore at this stage the electricity consumption from all other estates was assumed to be for lighting and appliances and not included in the data collection template.

If more detailed information about further estates that have electric heating becomes available, LBH will upload this data on to the heat map at a later date.

2.2. Major heat loads - Proposed new buildings

A considerable amount of redevelopment is proposed to take place in the London Borough of Hackney in the next few years. It is important to take this into account as part of the heat mapping exercise because new developments give the London Borough of Hackney the opportunity to have an active role in promoting the implementation of decentralised energy systems via the planning system.

The majority of regeneration will be concentrated in specific areas of the Borough, some of which have Phase 1 Area Action Plans or Planning Guidance finalised or in development. Given below is a list of the areas that were included in the assessment:

- Hackney Central
- Dalston
- Hackney Wick
- Woodberry Down
- Housing Estates part of the Estates Regeneration Programme
- Bishopsgate Goods Yard
- Major housing developments that have been granted planning permission

Heat mapping the proposed buildings presented various issues as it required to make predictions on how development will unfold in the future, which is difficult to do with any certainty due to the current financial and property market situation. The approach to be taken was discussed during one of the project meetings and can be summarised as follows.

Wherever possible data was collected on the quantum of development and phasing for specific sites within the areas listed above, however in many cases figures and phasing had to be estimated based on discussions with relevant members of the LBH, Hackney Homes, planning application documentation and masterplanning documents.

Regeneration area	Quantum of development and phasing source
Hackney Central and Dalston	LBH Strategic Delivery Team provided indicative figures for the strategic sites within Phase 1 of the two AAPs
Hackney Wick	Indicative figures were based on draft AAP. AECOM made some assumptions on building types and phasing
Woodberry Down	Planning Statement from the Outline planning application and the published phasing plan were used
Estates Regeneration Programme	The location and status of estates being regenerated was discussed in a meeting with the Housing Renewal Team at Hackney Homes. AECOM made some assumptions on phasing based on the discussion
Bishopsgate Goods Yard	Planning Guidance document and communication with Tim Midwood at LBH were used by AECOM to make some assumptions on building uses and phasing ²
Granted housing developments	LBH Monitoring and Research Team provided a download from the London Development Database giving details of numbers of units and location of granted housing developments. AECOM made some assumptions on timing of development and phasing.

Table 3: Summary of data sources for proposed development

Benchmarks were used to associate energy demands with the proposed buildings, these are shown in Table 4 below. For domestic buildings the benchmarks are based on energy modelling carried out for typical house types averaged according to the housing mix expected in Hackney. Different benchmarks were used for different phases of development to take account of the minimum fabric improvements that will be enforced by future revisions of the Building Regulations. The building specifications used in the modelling are based on work carried out by the Zero Carbon Hub³ and are expected to meet fabric efficiency levels likely to be required by future revisions of Building Regulations in 2013 and 2016.

For non-domestic buildings the benchmarks are derived from CIBSE Guide F and are the best practice figures. It has been assumed that the energy demands benchmarks will not change in future years and that the necessary carbon savings will be achieved by low and zero carbon technologies rather than efficiency improvements. This assumption had to be made because there is still considerable uncertainty around proposed future changes in Building Regulations for non-domestic buildings; the assumption reflects the difficulties associated with improving the fabric efficiency of non-domestic buildings without increasing demand for cooling.

It was agreed in one of the project meetings that the LDA would be developing these benchmarks so that the same assumptions are applied to the whole of the London Heat Map. Therefore the benchmarks used in the data collection tool are only indicative and will need to be replaced by those developed by the LDA in due course.

² Note: as the planning guidance states that development is not likely to begin in earnest until market conditions improved, we only included in the data set some transitional mixed uses that are proposed to be provided in the short term to support the new Shoreditch High Street station due to open later this year.

³ Defining a fabric energy efficiency standard for zero carbon homes (November 2009)

Building type	unit	2010-2012	2013-2015	2016-2019	2019+
Dwellings (fuel consumption based on individual gas boilers)	kWh/m ² /year	64	59	54	54
Employment (air conditioned standard office)	kWh/m ² /year	97	97	97	97
Retail (clothes shop)	kWh/m ² /year	65	65	65	65
LA community centres	kWh/m ² /year	125	125	125	125
Primary school	kWh/m ² /year	113	113	113	113
PCT Clinic	kWh/m ² /year	174	174	174	174

Table 4: Benchmarks assumed for proposed new buildings

Please note that these are indicative only and have been included just to obtain some preliminary results within this project's timescale. They should be reviewed and updated by the LDA before the data is uploaded to the London Heat Map.

Assumptions had to be made in relation to the heating systems used in the proposed developments, as most of them are yet to be determined.

In many cases the proposals were at a very early stage and layout plans were not available, therefore it was not always possible to associate a specific grid reference to the data provided. In these cases assumptions had to be made.

Given below is a summary of the assumptions made:

- Sites with commercial development of less than 1000m² and housing developments of fewer than 35 dwellings were not included. This is already in excess of what stated in the LDA template, which requires only to include private residential development with more than 149 units and private commercial of more than 9,999m² of floor area. The LDA template focuses on *major* heat loads and the smaller sites were not thought to fall under this definition. This is particularly true for new development as, due to updates in the Building Regulations, new buildings have already considerably lower heating loads than existing ones.
- Where no other information was available, it was assumed that buildings would be served by gas boilers.
- Where planning information suggested that gas CHP and district heating networks were planned, this was stated in the spreadsheet but no details were provided on the heat load met by the CHP or its effect on the CO₂ emissions, as not enough information was available to provide this data. In these cases the heat loads and CO₂ emissions provided assume only the use of gas boilers.
- Where unknown, ownership was stated as "Other" from the drop down menu in the spreadsheet. It is assumed that many sites would include a combination of public and private ownership.
- For Hackney Wick, Woodberry Down and Bishopsgate Goods Yard, where information was not available for specific sites but only for phasing areas, the grid reference provided refers to as close as possible to the centre of the area the figures refer to.

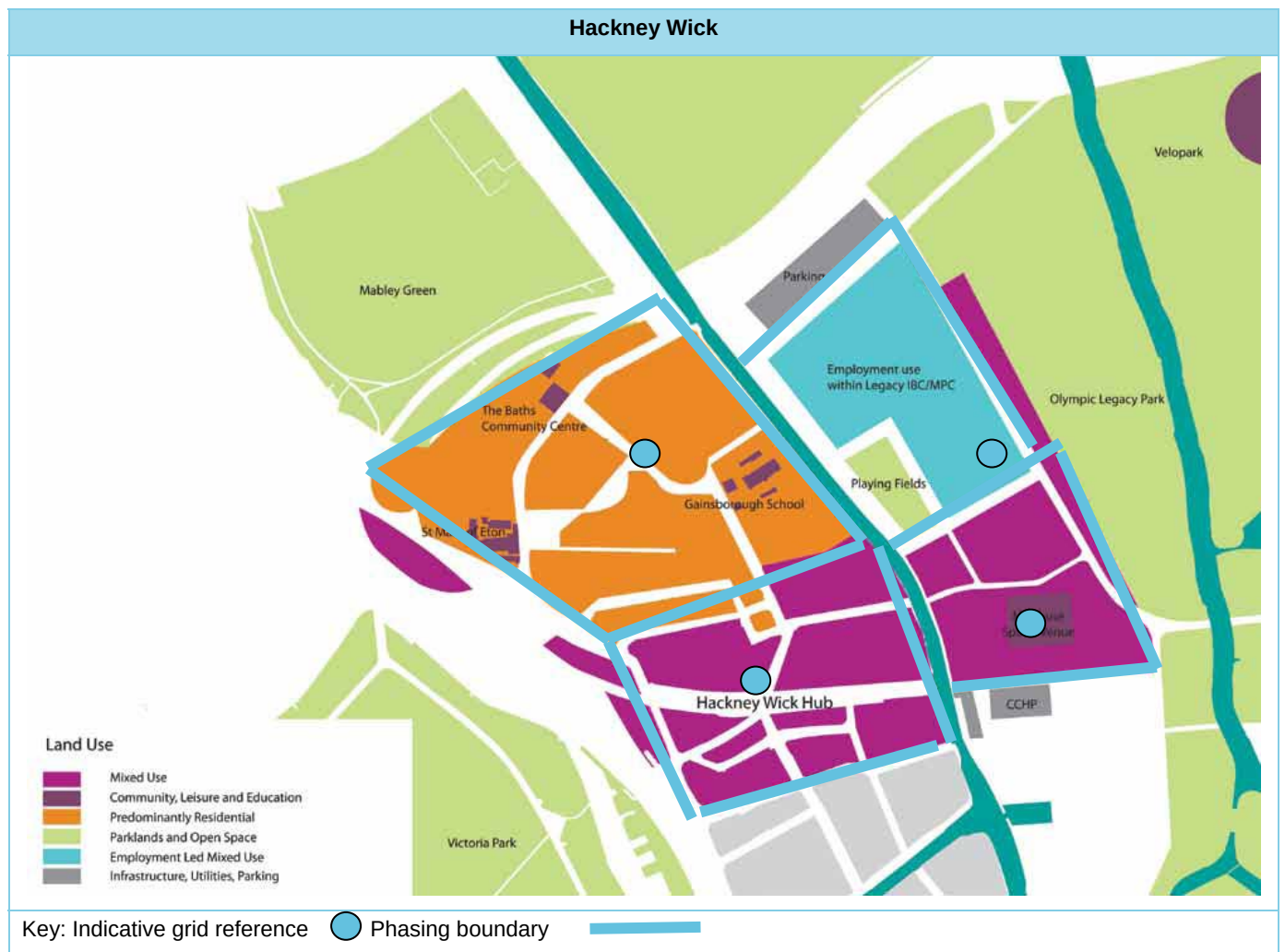


Figure 2: Hackney Wick indicative grid references and phases (land use map courtesy of LBH)

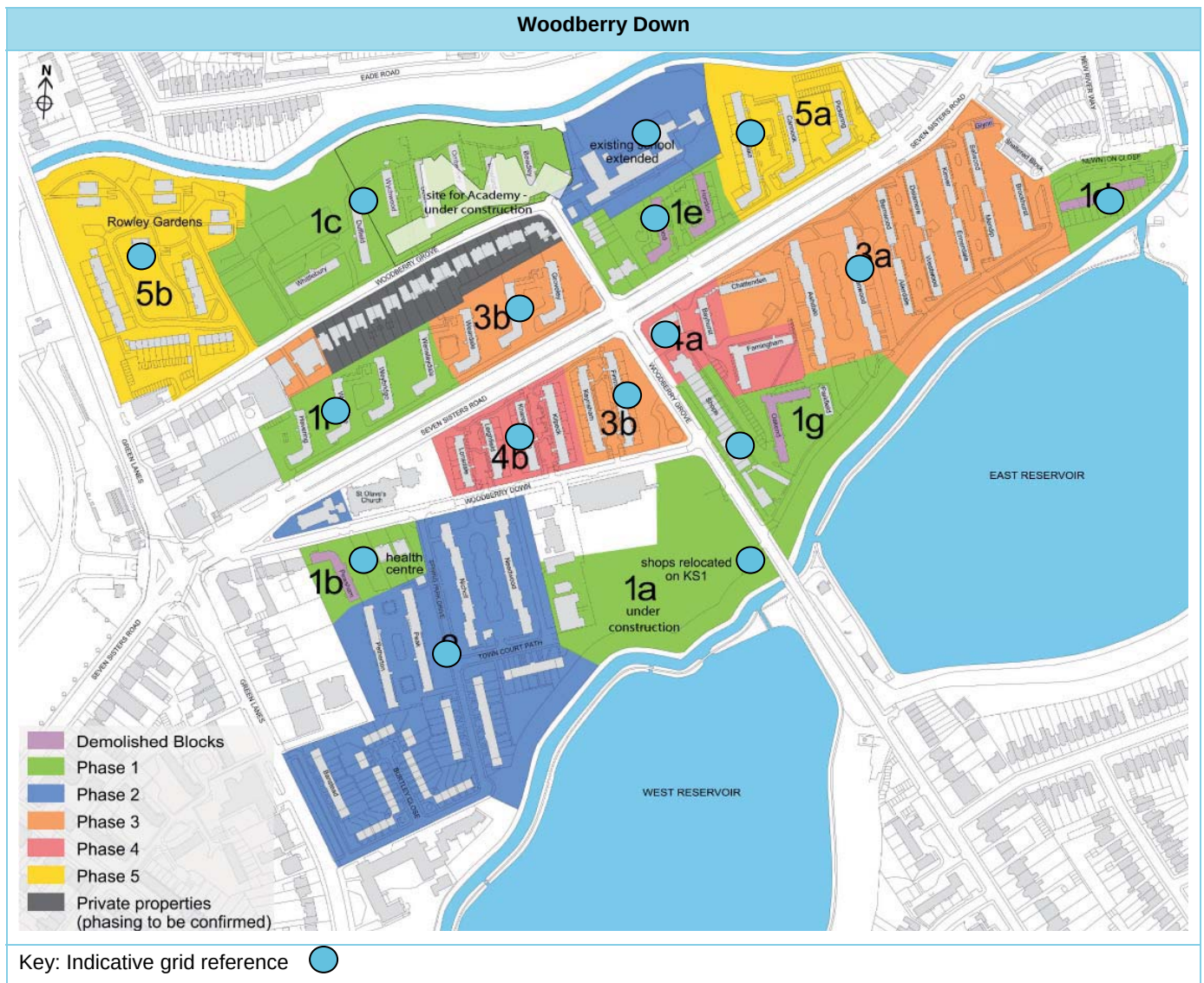


Figure 3: Woodberry Down indicative grid references and phases (phasing map courtesy of LBH)

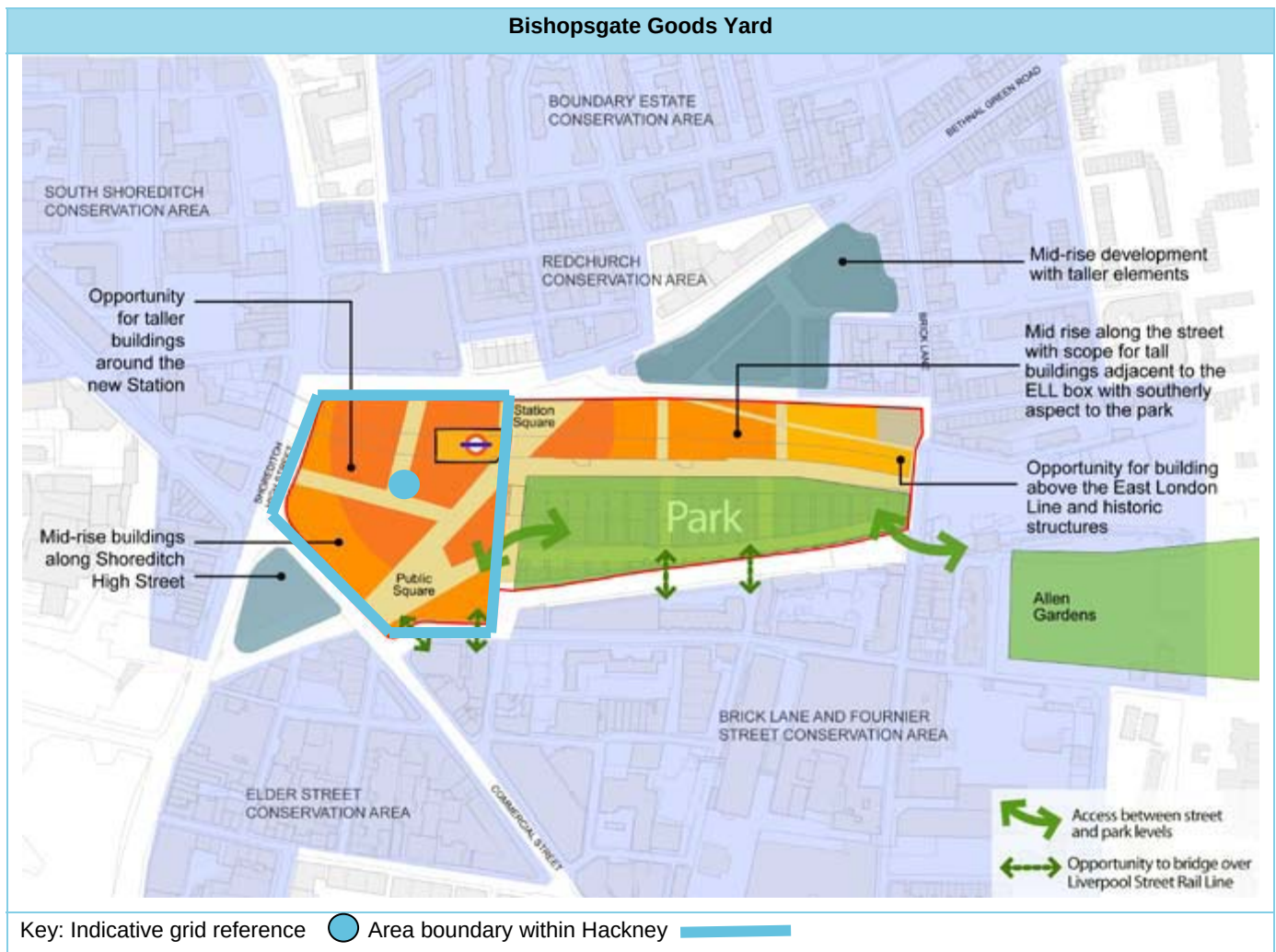


Figure 4: Bishopsgate Goods Yard indicative grid references and phasing (only the selected area is within Hackney) (land use map courtesy of LBH)

2.3. Existing district heating networks

Two communal heating systems served by CHP have recently been developed and a further six are expected to be installed as part of new development proposals. Due to the fact that they are very new or in development, it was not possible to obtain detailed information about them; however they have been identified within the major heat loads data collection.

With regards to existing buildings, Hackney Homes provided a list of their estates that are currently served by communal heating systems. It was confirmed that none of them are currently powered by CHP and that only two are proposed for redevelopment to include district heating and CHP (Cranston and Woodberry Down). Six of the estates served by communal heating systems are currently fuelled by oil.

All the estates with communal heating were listed under existing district heating networks even though the systems were only serving part of the estate and do not extend outside the individual buildings. It should also be noted that the heating systems in these estates are very old and often with uninsulated pipework. Therefore in the event of connection to a wider district heating network, it is most likely that they would have to be replaced. Given below is a summary of the main findings relating to existing and proposed communal heating systems.

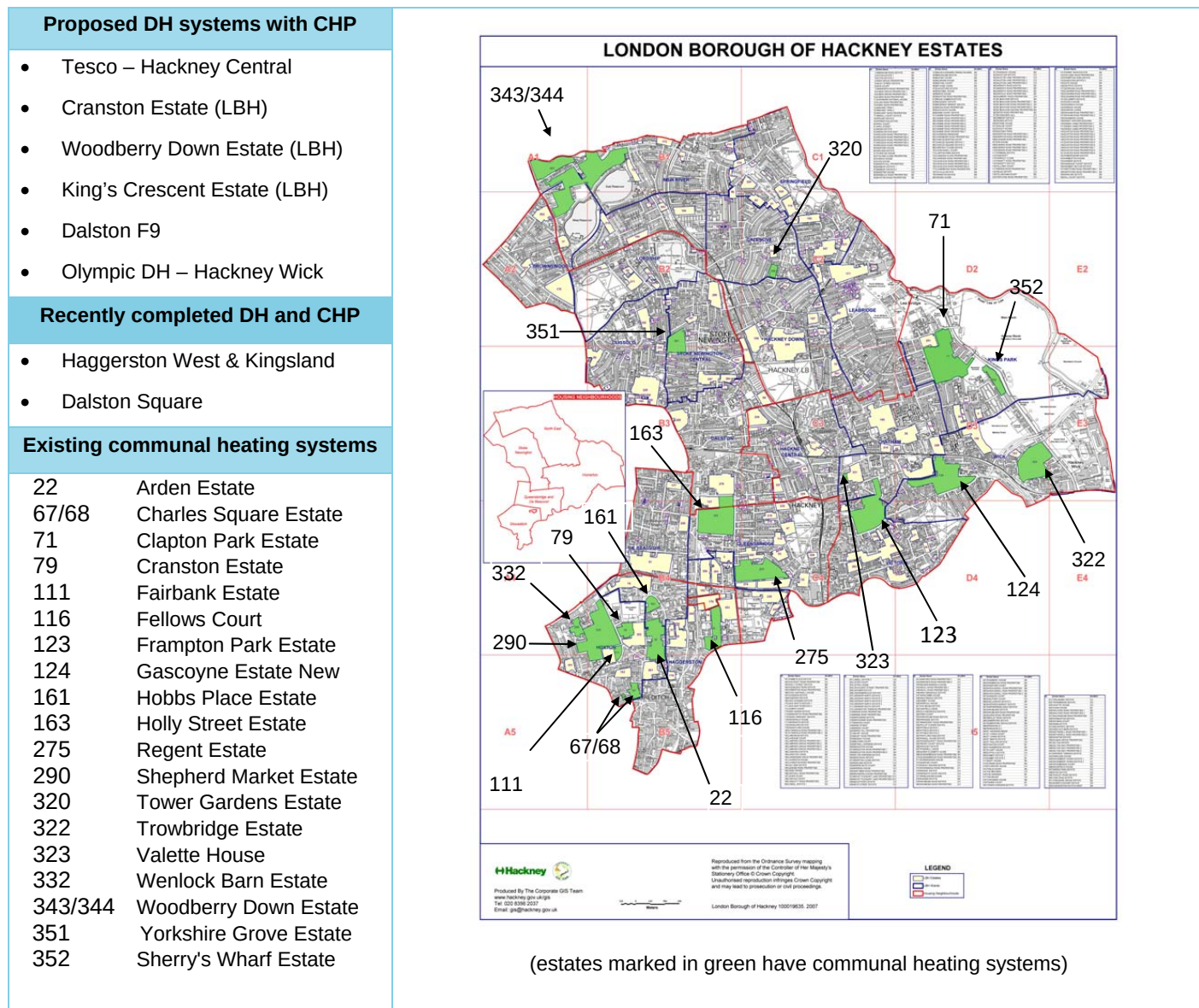


Figure 5: Summary of new and existing communal heating systems (estates map courtesy of LBH)

2.4. Major heat supply plants

No existing major heat supply plants were identified within Hackney, however the King's Yard energy centre was included in the data collection spreadsheet. King's Yard is just outside Hackney's boundary with Tower Hamlets in the south eastern corner of the Hackney Wick masterplan site. It will be the energy centre serving the district heating network for the Olympic site and therefore will be serving the eastern part of the Hackney Wick area. Depending on heat availability and ease of connection, the Olympic district network could potentially be extended to the western part of Hackney Wick.

It is also worth noting that proposals for the Cranston Estate CHP systems include the provision of spare capacity with the aim to extend the DH network to neighbouring estates in the future.

Two maps were provided, one with both existing and proposed sites, and one with only existing sites. These maps include data points collected by AECOM as well as points already held by the LDA. Larger versions of these maps are provided in Appendix B.

The maps given in Figure 6 were useful to identify clusters of buildings of different uses that could present opportunity areas for the development of district heating networks, however they did not include any information about the actual energy consumption of those buildings.

In order to include the energy data collected or estimated as part of this heat mapping exercise, AECOM produced a map showing the fuel consumption data against the background of the current London Heat Map.

The dots for the various sites were given different sizes depending on the energy consumption data associated with that building/site expressed in MWh of energy consumption (for heat and hot water) per year.

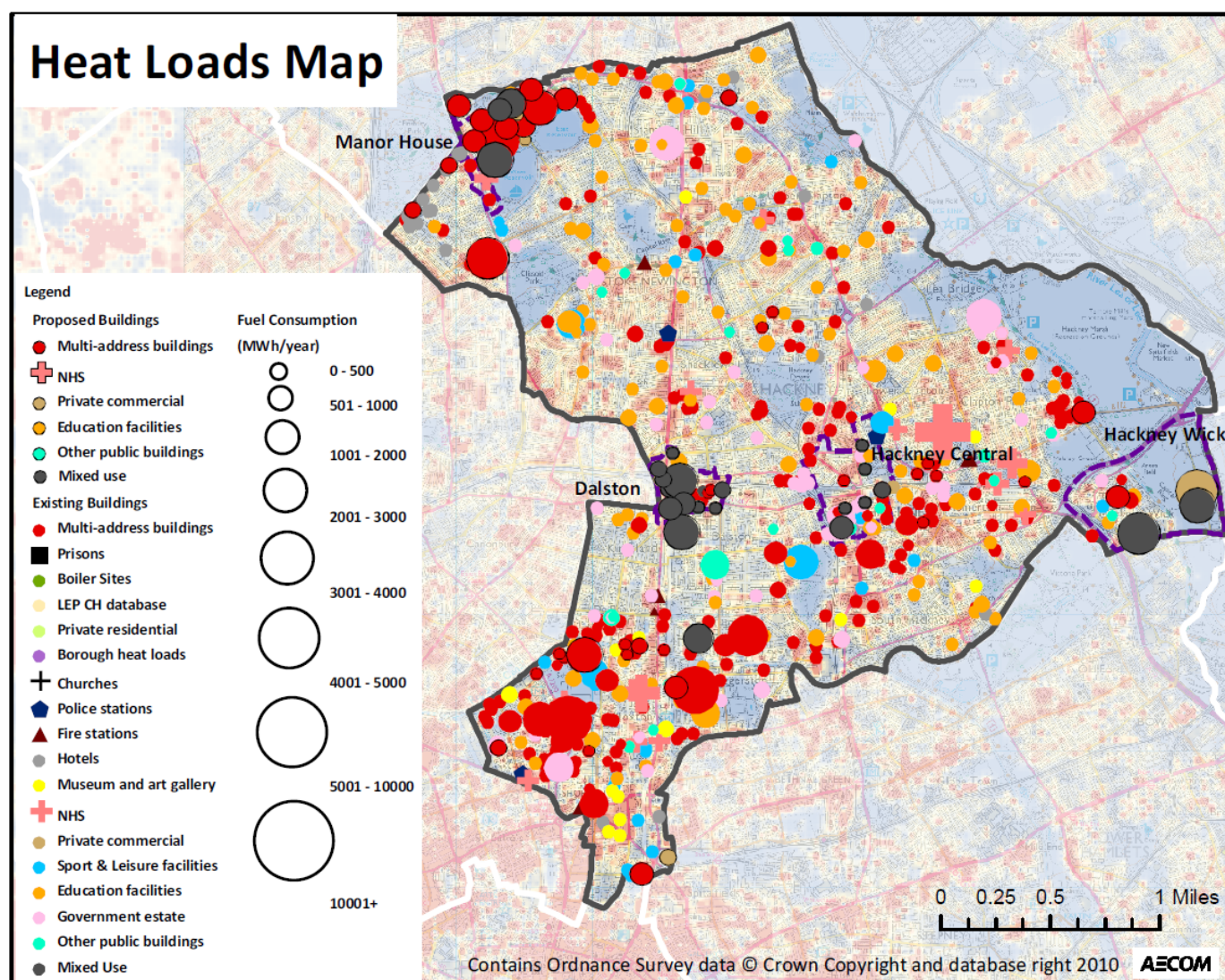


Figure 7: Hackney heat loads map

3.3. How to interpret the energy data map

The energy data given in Figure 7 is the yearly heating fuel consumption for the individual building or site. This means that a big circle on the map is equivalent to dark red on a heat map.

It is worth noting that there was huge variation in the data, which could not be easily shown on the map. Figure 8 represents the whole dataset on a logarithmic scale and shows that one site had a heat demand in excess of 10,000MWh/year (Homerton Hospital) and approximately 60 sites have heat demands over 1,000MWh/year. However the majority of the sites have significantly lower demands. The graph also shows that a large number of sites have very small demands, these are mostly individual dwellings from the Hackney Homes stock. In many cases these were flats in the same block therefore the data was aggregated and associated with a single grid reference point on the map in Figure 7.

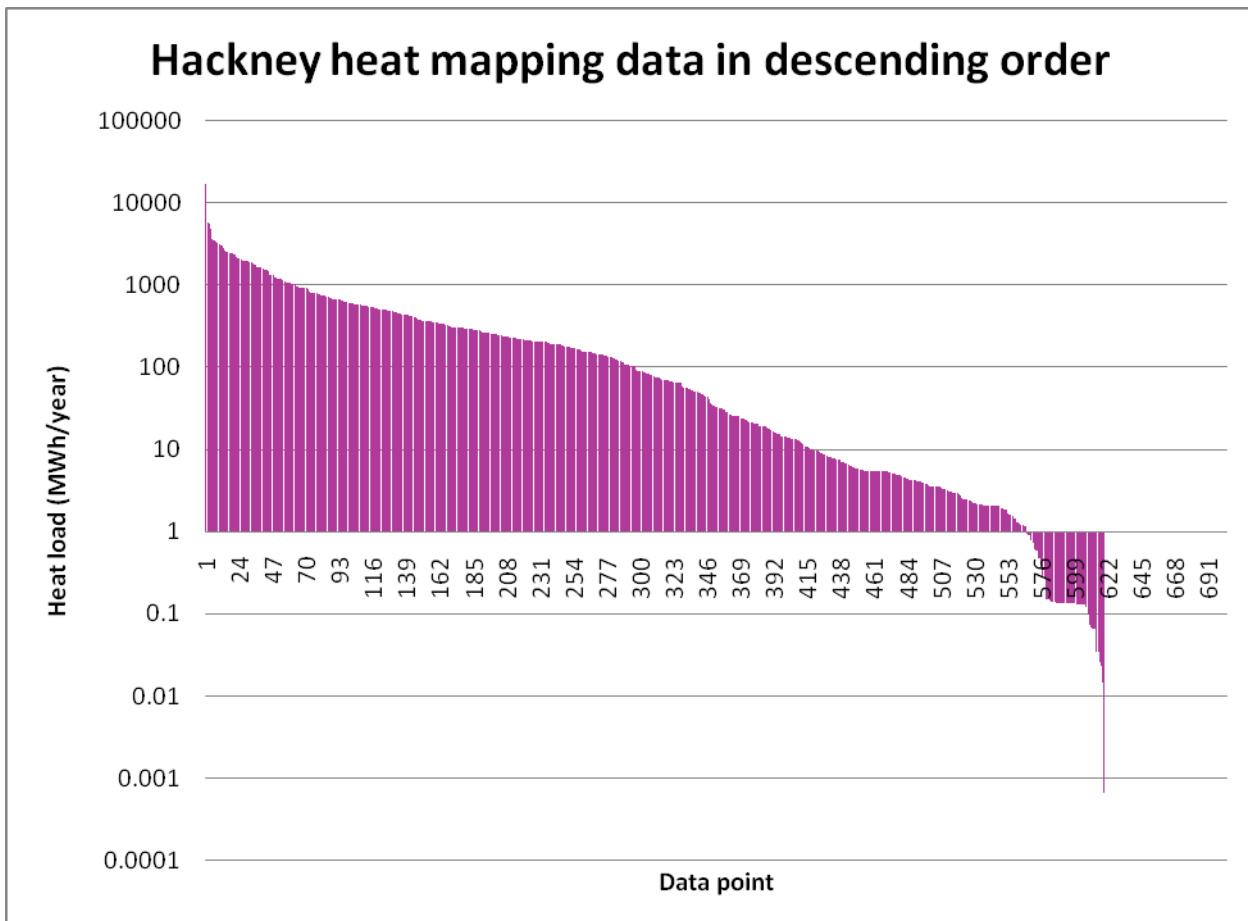


Figure 8: Heat load map data in descending order

It should be noted that in a few instances data was collected about existing buildings within areas that are planned for redevelopment (e.g. Woodberry Down, Hackney Wick). In these cases there is potentially double counting of heat loads as the estimated data for proposed development assumes the redevelopment of the whole area. In order to avoid confusion on this

issue, heat demands for proposed development have been differentiated by a black outline around the mapped items from heat demands from existing stock.

3.4. Limitations of data collected and outputs

The short timescale of the project and the nature of the task mean that there are a number of limitations to the data collected and the outputs produced. Despite these limitations, it is believed that the data and outputs can still be used successfully to identify a list of sites with high potential for DH within the Borough and develop a high level implementation plan for priority sites.

AECOM recommends that, before uploading the data to the London Heat Map, the LDA reviews these limitations and considers them in light of the results of the heat mapping work carried out by other Boroughs. A strategic review could allow to mitigate some of these issues or at least to standardise the approach taken across all boroughs.

Data collection limitations:

- Actual data has been collected for a small proportion of all the Borough's buildings; if the aim is to have energy figures for each building, the remaining data will have to be based on benchmarks or further research will be required to gather more data. Requests for energy data are outstanding with various RSLs and academies, therefore further information may be added to the heat map directly by Hackney BC once this data becomes available.
- Actual data provided is mostly metered gas consumption, which covers space heating and hot water but often also cooking, which should not appear on a heat map. The proportion of gas used for cooking in most cases is very small relative to the heating and hot water demand, therefore this issue is unlikely to affect the outcome of this study.
- In some cases electric heating was present, but the data provided did not differentiate between consumption due to heating and consumption due to lighting and appliances. In the case of the Hackney Homes estates known to have electric heating, an assumption was made about the proportion required for space and water heating and this proportion was included in the data set. In the case of commercial buildings (a museum and a hotel) it was not possible to make a reasonable assumption without further investigation of the load profiles of the relevant buildings. In these cases the electricity consumption data was not included in the major heat loads list, but was provided separately for the LDA's consideration.
- Without considerable detailed study there is no way of guaranteeing that the data collected is complete and correct. All relevant information collected and sources used have been provided. LDA can take a view as to whether some data should be excluded because considered unreliable.
- The benchmarks used for new development need to be reviewed and updated before the data is uploaded on the LHM to ensure that they match what has been used in other boroughs.
- No data has been included for the Manor House AAP as this is at a very early stage and no figures are yet available on the proposed quantum and phasing of development.

Outputs limitations:

- The limitations in data collection mean that some of the information represented in Figure 7 may be incorrect. Of particular concern are the figures for the PCTs as they come from various sources, the reliability of which is uncertain. Data for some of the PCTs are based on meter readings, but these did not appear to be complete. Data from other PCT sites is based on information provided on display energy certificates (DECs). As DECs should be based on verified metered data, where it was available, this data source was preferred over the monthly metered figures. Another site of concern is the Millfields Depot. The data for this site sourced from the NI 185 database appears to be unrealistically high and is thought to be incorrect. This means that the large pink circle near the eastern boundary of the Borough, near Hackney Marshes should probably be disregarded.

- The map in Figure 7 represents the energy data collected by AECOM as part of this project as well as some sites previously identified by LDA (and shown in Figure 6). For these additional points no energy data was provided, therefore they have been represented on the map in Figure 7 with the smallest sized dots.
- The data collected on proposed new buildings (i.e. points with black outline) is based on assumed quantum of development. The existence of these heat loads will rely on various privately owned sites coming forward with appropriate development, therefore cannot be guaranteed at present.
- As discussed in section 2.2, for new development it was often impossible to provide a specific grid reference for where the building would be built. In these cases a single grid reference was used for the centre of the area being redeveloped, and the predicted energy demands for the various building types expected to be built in that area were all associated with that same reference point. In these cases all the energy data associated with one grid reference was added together to produce a total energy consumption figure for that location. Where more than one building type was associated with one grid reference, the sites were classified as “mixed use”.