Heat Mapping Study

London Borough of Waltham Forest

February 2011

PARSONS BRINCKERHOFF

PB 125 YEARS

Heat Mapping Study

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Prepared for
London Borough of Waltham Forest
Waltham Forest Town Hall,
Forest Road,
Walthamstow
London E17 4JF

Prepared by
Parsons Brinckerhoff
6 Devonshire Square
London EC2M 4YE
020 7337 1700
www.pbworld.co.uk

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Prepared by	**:**	**James Eland**
Checked by	**:**	**Rupert Green**
Approved by	**:**	**Dominic Bowers**

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EXECUTIVE SUMMARY

London Borough of Waltham Forest	Heat Mapping Study 2011

Parsons Brinckerhoff has been commissioned by the London Borough of Waltham Forest (LBWF) to carry out a Heat Mapping Study of the borough. This forms part of the wider Decentralised Energy Mapping (DeMAP) project funded by the London Development Agency.

The aim of the DeMAP programme is to identify and exploit opportunities for energy networks to be installed throughout London. This report forms part of this process by identifying clusters of high heat demand density in Waltham Forest.

LBWF has been instrumental in sourcing a wide variety of data from heat users within the borough, and PB considers the coverage of data collection to be excellent in the context of this study. The data collected has been plotted on a series of GIS maps (displayed in this report). These illustrate that whilst there appear to be a few viable clusters of loads, there are no clear concentrations of high heat demand.

LBWF and PB have agreed a set of criteria against which clusters of loads should be scored, in order to give a robust and auditable justification for scheme selection. This analysis has resulted in the selection of the following schemes to take forward:

- Blackhorse Lane
- Wood Street
- Northern Olympic Fringe
- Town Hall
- Walthamstow Town Centre

Whipps Cross Hospital also has a very significant demand for heat (the largest in the Borough), but there are only a limited number of loads close to the Hospital, and hence for this study there is no significant 'cluster' of demands that could form the basis of a heat network to emerge.

Many of the selected schemes are dependent upon the future heat loads anticipated with regeneration. The exception to this is the Town Hall scheme, which is based on existing loads. This suggests that this scheme could be developed first, and indeed there are other drivers such as the need to install new boilers in at least one building (YMCA) on this scheme that suggest that early implementation would be beneficial.

For the Town Hall scheme, and indeed all the clusters of loads identified in this report, the next stage of progress towards implementation should be to commission a detailed feasibility study that addresses both the technical and economic viability of a heat network linking the identified loads, sourcing heat from low-carbon heat sources.

This high-level heat mapping study has identified those areas and clusters of loads that appear to have the most potential to benefit from a decentralised energy network. The next stage of analysis, via feasibility studies, should quantify the environmental and economic benefit of scheme implementation over a project life-cycle. If feasibility stage work demonstrates viability, then a business plan identifying funding and operating models should be constructed. Again, if this is successful, this could lead to tendering, detailed design and finally implementation. This study represents the first stage of a decentralised energy development process, and hence only provides an indication of strategic areas of focus for LBWF.

This report has identified several redevelopment areas as key clusters in the Borough. This leads to the recommendation that LBWF actively maintains an ongoing dialogue between all potential developers of these areas to ensure at an early stage that all parties are aware of the benefits that a decentralised energy system can provide, and that developers are aware that there are nascent schemes being developed.

The outputs of this study also highlight the need to protect the potential for decentralised energy schemes to emerge. For example, properties which are located in areas of key potential should be encouraged to do the following:

- Maintain centralised wet-radiator systems (e.g. avoiding changes to electric heating, and avoid shifts from centralised supply system to individual dwelling systems)
- Where appropriate, delay boiler replacement programmes to avoid unnecessary costs where a district heating solution will be implemented.

Further it is recommended that, as per the Draft London Plan, LBWF adopt a policy that demands that major development in key cluster areas demonstrates adherence to an appropriate energy hierarchy that reflects the potential to connect to decentralised energy networks. This is reflected in the draft Core Strategy proposals that are currently in development.

1 INTRODUCTION

1.1.1 London Borough of Waltham Forest has commissioned Parsons Brinckerhoff to conduct a heat mapping study of the borough. This study forms part of a London-wide drive to identify opportunities for decentralised energy, and also is closely tied to the low-carbon agenda of national planning policy.

1.1.2 The UK has set out its intent to be a global leader in tackling climate change by self-imposing mandatory carbon reduction targets enshrined in law and policed by the Climate Change Committee. National targets – one being a 34% reduction in CO_2 emissions by 2020[1] – are cascaded down with the result that regional agencies and local government will be required to deliver carbon reductions of a similar quantum in their administrative areas. Planning policy has been re-drafted to provide incentives for deploying renewable and low carbon energy sources and local planning authorities (LPA's) are required to produce development frameworks compatible with both the headline targets and planning guidance. In this context the London Development Agency (LDA) and Greater London Authority (GLA) have prepared a heat map to deliver low carbon energy to London. The London Heat Map project is part of the wider Decentralised Energy Master Planning (DeMAP) programme which aims to facilitate achieving the target of meeting 25% of London's energy supply from decentralised energy by 2025, and to provide LPA's with the evidence required to support policies favouring decentralised energy in their Local Development Framework documents.

1.1.3 A number of reports have recently been completed in Waltham Forest (LBWF) related to the mitigation of climate change, including the Waltham Forest Climate Change Evidence Base Study[2]. This study addresses both demand projections and the potential for combined heat and power (CHP) and district heating whilst also stating, "a detailed energy masterplanning exercise is needed to ensure any arrangements take full account of the opportunities for linking systems to existing development"[3]. This Heat Mapping Study contributes to this identified requirement, by providing higher resolution data on heat demands throughout the borough, and by carrying out detailed mapping of opportunities.

1.2 Policy Background

1.2.1 The following short section does not aim to give a complete synopsis of relevant planning policy literature, but provides reference to some of the key documents that form a background to this study.

1.2.2 PPS 1 Supplement – Planning for a Low Carbon Future in a Changing Climate – Consultation document March 2010

1.2.3 This consultation sought views on the proposal to combine and update existing planning policy on climate change and renewable energy from two documents into one. Building from current approaches, the new proposed policy reflects the latest legislative and policy context. The Planning Policy Statement (PPS) will be a supplement to Planning Policy Statement 1: Delivering Sustainable Development (PPS1).

[1] The UK Low Carbon Transition Plan, 2009.

[2] Waltham Forest Climate Change Evidence Base Study, final report, January 2010.

[3] Ibid, page 171

1.2.4 *Paragraph 58 - local energy planning*

1.2.5 The PPS supplement requires LPAs to take a more proactive approach to local energy planning, with clearer requirements for the evidence base at local level, and an expectation that LDFs will provide a supportive framework for renewable and low carbon energy that specifies relevant opportunities. This approach to local energy planning should provide a clearer framework in which to bring forward decentralised and renewable energy and consequently make delivering this easier and more cost effective.

1.2.6 Local authorities are identified as having an important role in the implementation of decentralised energy systems. The risk to developers in utilising this technology is identified along with the requirement for schemes based upon anchor customers, namely large non-domestic buildings. The PPS expects LPAs to assess opportunities for decentralised energy, focusing on opportunities "at a scale which could supply more than an individual building".

1.2.7 Adopted Waltham Forest Unitary Development Plan

1.2.8 Whilst it is soon to be superseded by emerging Local Development Framework documents, Waltham Forest's Unitary Development Plan (UDP) was adopted in 2006 and sets out the detailed land use policies and proposals for development in the borough. WPM 21 states that "the Council expects proposals to incorporate and enable 10% of total predicted energy consumption to be from renewable energy sources, through on-site generation for all new commercial/ industrial developments over 1000 sq ms and housing developments of 10 or more units." Paragraph 9.81 promotes the use of CHP, amongst other technologies, but does not explicitly advocate district heating and decentralised energy systems.

1.2.9 Local Development Frameworks (LDF)

1.2.10 LDFs will replace UDPs and central to LDFs are Core Strategy documents. Core Strategies provide the strategic vision, objectives and policies for Boroughs up to 2026. LBWF has prepared its Core Strategy Proposed Submission, and this document is out to consultation until 28th February 2011. Core Strategy CS5 seeks to facilitate the implementation of local decentralised energy networks, especially district heating systems, in appropriate areas of Waltham Forest.

1.2.11 The Core Strategy CS5 is supplemented by the Development Management Policies Development Plan Document. The Development Management Policies provide further details and targets and set out criteria based policies which will be used to assess and determine planning applications.

1.2.12 Preferred Options Policies DM11 and DM12 address low carbon standards and the DPD contains draft requirements for Developers to meet. Sections B and C of Policy DM12 are most relevant to this study. "*The Council will seek to reduce emissions by:*

B. Requiring new developments to assess opportunities for and implement decentralised heat and energy networks where appropriate, including links into and expansion of existing networks, unless it is demonstrated that there is not enough heating demand for an efficient connection;

C. Requiring major developments that have demonstrated that the connection to an existing or the implementation of an new decentralised energy network is not feasible, to be connection ready for future and to make a contribution towards the installation of

an area wide decentralised energy network or other carbon reduction measures within the borough, where appropriate; "

1.2.13 The draft replacement London Plan (2009)

The draft replacement plan provides a strong policy framework in support of using decentralised energy systems. A number of policies in the draft replacement London Plan pertain to the use and support of decentralised energy. Boroughs are encouraged to develop policies and proposals to identify and establish decentralised energy network opportunities. As a minimum boroughs should[4]:

a. Identify and safeguard existing heating and cooling networks

b. Identify opportunities for expanding existing networks and establishing new networks. Boroughs should use the London Heat Map tool and consider any new developments, planned major infrastructure works and energy supply opportunities which may arise

c. Develop energy master plans for specific decentralised energy opportunities which identify:

- major heat loads (including anchor heat loads, with particular reference to sites such as universities, hospitals and social housing)
- major heat supply plant
- possible opportunities to utilise energy from waste
- possible heating and cooling network routes
- implementation options for delivering feasible projects, considering issues of procurement, funding and risk and the role of the public sector.

d. Require developers to prioritise connection to existing or planned decentralised energy networks where feasible.

1.3 Upper Lea Valley Energy Masterplan

1.3.1 The LDA has commissioned an energy strategy for the Upper Lea Valley Opportunity Area that will form part of the overall Upper Lea Valley Opportunity Area Planning Framework which is being led by the GLA, in collaboration with the relevant London boroughs and other key stakeholders.

1.3.2 This study concludes that the Upper Lea Valley, in certain areas, is well suited to the development of district heating, due to the scale and density of regeneration, as well as the presence of existing heat producers and customers. The study advocates the development of a radial network of low temperature hot water distribution, with key heat sources identified in the Central Leeside area (e.g. including Edmonton Incinerator amongst others). The Blackhorse Lane regeneration area is cited as one of five key significant demand hubs.

[4] Derived from Policy 5.5 (B) of the Draft Replacement London Plan

2 METHODOLOGY

2.1 Outline Approach

2.1.1 Parsons Brinckerhoff (PB) recognises that historically, the development of district heating in the UK has been based primarily around public sector anchor customers. This has led to the use of a two-stage methodology that puts additional focus first on the public sector, and secondly on private customers in terms of identifying clusters of demands that represent opportunity areas for district energy.

2.2 Key Data Sources

2.2.1 LBWF has been instrumental in gathering a wide selection of data for the borough that has been analysed and filtered by PB.

2.2.2 Data has been gathered from the following sources:

2.2.2.1 *LBWF council records (received from LBWF Energy Manager)* – this data contains recorded gas usage information for a wide range of council buildings, including many of the education facilities, public buildings, and council offices.

2.2.2.2 *Area Action Plan details* – LBWF has supplied PB with some details of the developments anticipated in the borough's Area Action Plans. Three levels of detail have been provided:

- For some areas details of build-out floor areas, dates, and usage types have been provided – for these entries. PB has applied appropriate benchmarks to the date and type of building usage to estimate heat demands (Northern Olympic Fringe, Walthamstow, Wood Street, Whipps Cross Hospital residential development).

- For other areas details of build-out floor areas and usage types (but without development dates) have been provided – for these entries. PB has made assumptions on build out phasing, and applied appropriate benchmarks to the assumed date and type of building usage to estimate heat demands. (Blackhorse Lane).

- For some areas only a total land development area has been given, with an indication of the potential range of building types anticipated. In this instance, PB considered the level of assumptions that would have been required to estimate heat demands to be too high, and for these areas a notional, blanket assumed heat demand of 500MWh/year has been adopted in cluster mapping. This has been used in the analysis of potential clusters of opportunity in the borough, but these data points are not included within the London Heat Map database. (Walthamstow Greyhound Stadium, former Car Park, Walthamstow Stadium, Chingford Municipal Offices, Chingford Storm Tanks, EDF Energy site, Cathall Road, 4 Buxton Road, Walbrook Works, 66 Norlington Road, Tfl Car Park Leytonstone, South Chingford Car Park)

2.2.3 *Ascham Homes* – Ascham Homes are one of the largest Registered Social Landlords (RSLs) within the Borough, and have a number of large estates under their management control. Ascham Homes have been very helpful in providing details of their stock and gas usage.

2.2.4 *DECC Statistics* – At progress meeting stage. PB presented the Lower Level Super Output Area gas demand figures to LBWF in graphical format, illustrating the residual heat demand density of each LLSOA after subtraction of the recorded point loads from other data sources. The value of this presentation was discussed but it was considered that the point load data should take precedence.

2.2.5 *Display Energy Certificate (DECs)* – LBWF provided PB with the data behind their DECs and PB has cross checked this data against the other council data provided.

2.2.6 *Faith Groups* – LBWF provided PB with a shortlist of the five most significant faith buildings within the borough for inclusion within the study. PB has measured the floor area of these buildings from OS maps and, by using street-level visual mapping tools, has also recorded the approximate number of stories of each building. This gives a total area against which appropriate benchmarks for fuel consumption can be applied.

2.2.7 *Lee Valley Regional Park* – four locations within the Lee Valley Regional Park were supplied. PB contacted these establishments to check whether in any instances there was a significant cooking gas or other fuel use component. This was considered relevant particularly for the Ice Rink.

2.2.8 *Existing London Heat Map* – the LDA has sourced data relating to some residential properties, leisure facilities and fire/police stations (inter alia), and PB has corroborated this data through visual street-level mapping tools, and measured building areas and applied benchmarks where possible.

2.2.9 *NI185 Data* – LBWF has also supplied PB with the National Indicator 185 data, which contained many duplicate entries with the DEC statistics and base council data set, but which also included further entries particularly in the education sector.

2.2.10 *PCTs* – Primary Care Trust data has been provided from an LDA organisation called REFIT. REFIT has provided recorded gas usage information for the borough, albeit many of the locations have lower consumptions than the 200MWh/year threshold adopted in the study.

2.2.10.1 *PFI Schools* – LBWF has sourced data on nine Private Finance Initiative schools.

2.2.10.2 *London Development Database* – The London Development Database contains records of all the planning applications made within the Borough. This dataset contains duplicates with the Area Action Plan information noted above but also provided additional sites for inclusion in this study.

2.2.10.3 *Waltham Forest College* – LBWF requested data directly from Waltham Forest College, which is a significant heat user within the Borough.

2.2.10.4 *Whipps Cross Hospital* – Similarly, LBWF provided contact details at Whipps Cross Hospital and PB sourced data directly from the hospital energy manager.

2.2.10.5 *YMCA* – The Young Mens' Christian Association were also contacted and have provided energy consumption data. This was considered relevant due to its location close to the Town Hall and a potential energy cluster in this location.

2.2.11 It should be noted for all of the buildings identified throughout this project, that a 200MWh threshold of heat demand has been applied – e.g. if the annual heat demand of a particular building was found to be below this figure, then the load is excluded from the dataset used for cluster analysis and from the London Heat Map

database. This threshold effectively eliminates the inclusion of loads that are unlikely to be economic to connect. This is, of course, a crude sorting mechanism, but is considered appropriate for this high level of analysis. At later stages of scheme identification and implementation it would be important to identify all potential loads (including those below this threshold) close to district energy pipework routes in order to maximise economic efficiency.

2.2.12 CHP

2.2.13 A number of sites are known to have existing CHP plant installed, and in terms of this study, these have been taken account in the following way. It has been assumed that where the units are operational, that they operate at typical efficiencies for their scale and for a standard number of hours per year. These assumptions allowed PB to carry out a calculation of the anticipated heat output from the CHP units, in order to estimate the total heat demand of the site (as opposed to the fuel consumption).

2.2.14 The following CHP units were considered in this way:

NAME AND ADDRESS	CHP size (kWe)	Other details	Currently operational?
MARLOWE ROAD CHP (formerly Marlow Road Estate)	330	2 no. 165kWe units	No
ST NICHOLAS TOWER, ALDRICHE WAY	250	1 no 165kWe, 1 no. 85kWe	Yes
FRED WIGG & JOHN WALSH TOWERS	85	2 no 165kWe, 1 no. 85kWe - only smaller system is assumed to be working	Partially
STOCKFIELD ROAD ESTATE MAIN BOILER HOUSE	85	1 no 85 kWe	Yes
WALTHAMSTOW TOWN HALL	165	1 no. 165kWe unit	No
BAKERS ALMS HOUSES, LEA BRIDGE ROAD	26	1 no. 26kWe unit	Yes
BULWER COURT FLATS, BULWER COURT ROAD	26	1 no. 26kWe unit	Yes
WALTON HOUSE (formerly Chingford Mount Day Nursery)	30	2 no. 15kWe	Yes
HOLMCROFT HOUSE, 14 ORFORD ROAD	12	1 no. 12kWe unit	Yes
GODDARTS HOUSE, 23 HOE STREET	13	1 no. 13kWe unit	Yes

3 RESULTS – HEAT DEMANDS

3.1 Domestic existing

3.1.1 Appendix A1 (drawing PEL285432A_04E (A)) illustrates the location of identified residential loads within the Borough. This set of data does not show single-ownership terraced houses, for example, but focuses on multi-address blocks of flats or other multi-tenanted buildings. It is not certain in all cases that these have 'wet-systems' (e.g. water-filled radiators) that would be suited to integration with a DH system, but this level of detail is outside the scope of this study.

3.2 Non-domestic existing

3.2.1 Appendix A2 (drawing PEL285432A_04C (A)) shows the locations and magnitudes of identified public sector / council-owned buildings. This is of particular importance to this study as these loads represent a set of loads that could potentially form the 'anchor' customers for emerging heat networks. In this context it is worth noting the key clusters of large loads around the Town Hall.

3.2.2 On this map two categories are displayed, 'Council' and 'Education'. Most of the education facilities are under LBWF control but there are some instances where this will not be the case (e.g. PFI schools) and some higher education facilities (e.g. Waltham Forest College).

3.3 Future Development

3.3.1 Appendix A3 (drawing PEL285432A_04D (A)) illustrates the identified future development in the Borough. These are also key loads as the increasing stringency of environmental standards requires new development to consider decentralised energy solutions.

3.3.2 In circumstances where the connection of a future development to a decentralised energy network displaces the need for on-site low carbon technologies, developers may be willing to provide a 'developer contribution' towards the cost of the decentralised energy solution, and this means of leveraging investment can significantly assist the realisation of networks.

3.3.3 It is anticipated that these requirements will be strengthened through emerging Local Development Plan policies. The Council will require new developments through LDP policies to assess opportunities to connect to existing or implement new decentralised energy networks where appropriate. Where such connection is not feasible, developments are likely to be required to be 'connection ready' for future networks and to make a contribution towards the installation of an area-wide decentralised energy network or other carbon reduction measures within the borough.

3.4 Combined Map

3.4.1 All of the loads identified within the Borough (above the agreed 200MWh/year heat demand threshold) are displayed in Appendix A4 (drawing PEL285432A_04B (A)).

3.5 Cross-Borough Opportunities

3.5.1 As well as the comprehensive collation of data from within the Borough boundaries carried out by LBWF, PB has also examined the boundary of the Borough, in order to assess if there are any relevant cross-boundary loads that could contribute to the formation of opportunities for decentralised energy schemes.

3.5.2 This assessment of cross-boundary opportunities has been mindful that large opportunity clusters of buildings should be identified in heat mapping studies of the adjacent boroughs – hence particular attention was given here to identifying individual loads that could complement existing load clusters identified within Waltham Forest.

3.5.3 The key cross-boundary opportunities identified are considered to be:

- The Olympics site – despite the presence of a major rail link, the Stratford Olympics site is close to the Leyton Mills development area in the south west of the borough.
- The Edmonton Incinerator (Central Leeside) – this is a potential source of waste heat and is located in an industrial area close to the junction of Enfield, Haringey and Waltham Forest. In terms of opportunity, the Blackhorse Lane area has been identified as a potential future heat customer for a district heating network in a study conducted by the London Development Agency[5], the "Upper Lea Valley Energy Strategy".

3.5.4 Beyond these two key potential heat sources there do not appear to be any other key cross-boundary loads. The majority of the western boundary of the borough is separated from Enfield and Haringey by the chain of reservoirs that extend from north to south, and the eastern and southern boundaries to Redbridge and Newham are low-rise residential areas. The south-western borough boundary to Hackney has the highest concentration of potential non-domestic loads, but there are significant barriers to connections in the form of Hackney Marsh, the River Lea and numerous railway links.

[5] LDA, Upper Lea Valley Energy Strategy, April 2010, page 64

4 CLUSTER IDENTIFICATION

4.1 Cluster Selection

4.1.1 A two-stage process has been adopted to select clusters for further analysis. Stage 1 identifies and weights a number of clusters based on proximity of heat loads and total heat demand of such an identified cluster. Stage 2 refines this analysis based on additional criteria.

4.1.2 Stage 1

4.1.3 In Stage 1 of the analysis, clusters have been selected through a quantitative process that analyses both the proximity of other loads to each node on the map displayed in Appendix A4, and also calculates the total heat load of the load cluster. Extra weighting has been given to public sector heat load due to the Council's opportunity to influence their connections which might make implementation of DE networks more viable. This process effectively gives additional weight to public sector 'anchor loads', given the role that local authorities have played historically in successful DH development.

4.1.4 The following weighting has been applied to the relative importance of each these factors to give an overall score for clusters based around each individual load identified.

Weighting of Public Sector in Proximity and Total Heat Demand Analysis			
PROXIMITY		**TOTAL HEAT DEMAND**	
All	Public Sector	All	Public Sector
50%	**10%**	**30%**	**10%**

4.1.5 The weightings above illustrate that the scoring used has assigned additional weighting to Public Sector loads.

4.1.6 Stage 2

4.1.7 The second stage of analysis aims to refine further these initial scores, by introducing additional factors for consideration against each cluster of loads. The additional factors considered were as listed below:

Assessment Criteria	Weighting Factor (%)	Additional Notes
Proximity of closest loads (nearest neighbour analysis)	28.5%	Weighted scoring based on the total distance to nearest neighbouring loads, and the average distance of Public Sector loads
Total and Public Sector heat demand	19.0%	Weighted score based on the total heat demand of the identified cluster, and the element of this demand that is related to Public Sector properties
Proportion of new development	15.0%	Score based on the proportion of the heat demand that is from new development
Diversity of demands	5.0%	Score based on the number of different building usage types within the cluster
Presence of constraints	5.0%	Score based on the presence or absence of significant physical constraints to the installation of DH mains
Proximity of Edmonton Incinerator / Olympic Park	12.5%	Score based on the proximity of the closest loads in each cluster to either the Olympic Park or to Edmonton Incinerator
'Time Critical'	5.0%	Based on whether there are drivers encouraging the early development of the scheme
Proximity of other 'top 20' clusters	10.0%	Gives an indication of potential for future expansion to wider area schemes
Total	**100.0%**	

4.1.8 Each of these criteria and the means used to score each one is described below:

4.1.9 **Proximity of closest loads** – This is an assessment of the proximity of potential loads to each other. This analysis of nearest neighbours has been carried out quantitatively, after eliminating all of the loads identified with a total annual heat demand of less than 200MWh. This ensures that only more significant loads contribute to the 'nearest neighbour' analysis. The easting and northings recorded for the London Heat Map database were then used to identify the distance of each of the identified loads to all of the other loads in the database. The five closest neighbouring loads to each point were identified and the sum of these distances recorded. The total distances recorded on this basis provides the basis for the scoring in this category. On a linear basis, a total distance of less than 250m was given 10 points (e.g. maximum score), and distances of greater than 4,000m were given a zero score.

4.1.10 **Total Heat Demands** – the total heat demand of each cluster of loads identified in the 'Proximity of closest loads' analysis provides the numerical basis for the scoring of this criterion. Included within this score is an assessment of the element of the load that is related to Public Sector properties. Clusters with total heat demands greater

than 20GWh score 10 points (maximum) and the loads of 1GWh or less score zero points. All loads in between these two extremes were extrapolated on a linear basis.

4.1.11 **Proportion of new development** – this criterion is scored by evaluating the proportion of the total heat demand that is related to future development.

4.1.12 **Diversity of heat demands** – PB has assessed this on the basis of the mix of different load types identified within a cluster. A wide mix of uses receives a higher score. The scoring method of multiplying by two the number of additional different uses after the key load use within a cluster was adopted. E.g. A selection of 5 different uses in addition to the core load use would score the maximum of 10 points.

4.1.13 **Presence of constraints** – PB has assessed this based on the routes identified to connect the loads of the cluster. No constraints would give a high score in this category. A maximum score would be given where the whole network route was substantially through 'soft dig' ground where there is unlikely to be other buried services. No scheme qualifies for a maximum score in this context. Examples of scoring ratings are as follows:

Presence of constraints (Constraints score)	Constraints notes / examples
0	Multiple railway lines and A Road
1	Railway line and A Road
2	Railway line and Wood Street crossing (B160)
3	Crossing Selborne Road and railway line to reach station car park
4	Railway crossing
5	Crossing major A road (Forest Road)
6	Crossing A1006
9	No major constraints - normal London roads (hard dig)

4.1.14 **Proximity to Edmonton and the Olympics site** has been analysed on the basis of the shortest linear distance between the clusters and these two sites. A short distance scores highly in this assessment. A linear scoring system has been adopted, where if the site is less than 250m distant, then it would gain the maximum score of 10. If the site is greater than 4000m distant, then it receives zero points. All other scores have been extrapolated between these two extremes.

4.1.15 **'Time Critical'** – schemes that are known to have drivers encouraging swift development were considered to score more highly than those that have no particular identified drivers. PB is not aware of drivers of this nature for the majority of loads, and hence many clusters have been given a 'neutral' mid-range score in this category. Some buildings in the borough are known to have a boiler replacement programme scheduled, and hence if a decentralised energy scheme is to emerge, it would be beneficial to ensure that the avoided costs of boiler replacement are incorporated into the overall economic efficiency of delivery. Hence in this category, those loads where boilers replacement programmes are known to be scheduled score highly. The scores for this category were developed in conjunction with LBWF.

4.1.16 **Proximity of other 'top 20' clusters** – a score is allocated in this category based on the distance measured to the closest cluster within the top twenty clusters. A plan

illustrating the locations of the top 20 clusters is included within Appendix A8 (drawing PEL285432A_11_B (B)).

4.2 Scheme scoring

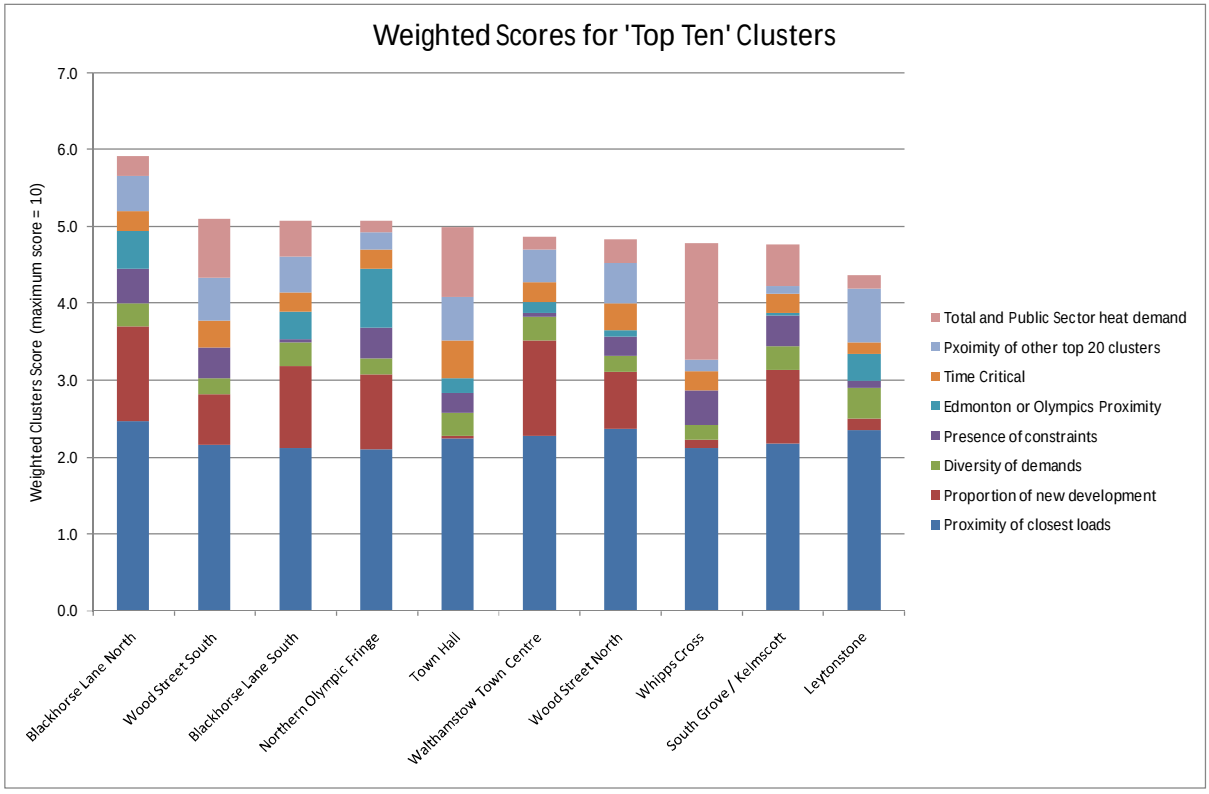
4.2.1 This section outlines the scores that have been developed for each of the criteria listed above. The un-weighted scores are shown below for 'top ten' ranking clusters. The clusters here are displayed in order of their total scores.

CLUSTER	Proximity of closest loads	Proportion of new development	Diversity of demands	Presence of constraints	Edmonton or Olympics Proximity	Time Critical	Pxoimity of other top 20 clusters	Total and Public Sector heat demand	TOTAL
Blackhorse Lane North	9	8	6	9	4	5	5	1	47
Town Hall	8	0	6	5	1	10	6	5	41
Wood Street South	8	4	4	8	0	7	6	4	41
Northern Olympic Fringe	7	6	4	8	6	5	2	1	40
South Grove / Kelmscott	8	6	6	8	0	5	1	3	37
Wood Street North	8	5	4	5	1	7	5	2	37
Blackhorse Lane South	7	7	6	1	3	5	5	2	36
Whipps Cross	7	1	4	9	0	5	1	8	36
Walthamstow Town Centre	8	8	6	1	1	5	4	1	35
Leytonstone	8	1	8	2	3	3	7	1	33

4.2.2 Applying the agreed weightings to these scores gives the following results:

WEIGHTED SCORES									
CLUSTER	Proximity of closest loads	Proportion of new development	Diversity of demands	Presence of constraints	Edmonton or Olympics Proximity	Time Critical	Pxoimity of other top 20 clusters	Total and Public Sector heat demand	TOTAL
Blackhorse Lane North	2.5	1.2	0.3	0.5	0.5	0.3	0.5	0.3	5.9
Wood Street South	2.2	0.7	0.2	0.4	0.0	0.4	0.6	0.8	5.1
Blackhorse Lane South	2.1	1.1	0.3	0.1	0.4	0.3	0.5	0.5	5.1
Northern Olympic Fringe	2.1	1.0	0.2	0.4	0.8	0.3	0.2	0.1	5.1
Town Hall	2.2	0.0	0.3	0.3	0.2	0.5	0.6	0.9	5.0
Walthamstow Town Centre	2.3	1.2	0.3	0.1	0.1	0.3	0.4	0.2	4.9
Wood Street North	2.4	0.7	0.2	0.3	0.1	0.4	0.5	0.3	4.8
Whipps Cross	2.1	0.1	0.2	0.5	0.0	0.3	0.1	1.5	4.8
South Grove / Kelmscott	2.2	1.0	0.3	0.4	0.0	0.3	0.1	0.5	4.8
Leytonstone	2.4	0.1	0.4	0.1	0.3	0.2	0.7	0.2	4.4

4.2.3 These results are presented graphically overleaf:



4.2.4 The same overall results are also shown below as total weighted scores ranked with the highest scoring cluster first:

Organised by Rank	Name	Score
1	Blackhorse Lane North	5.9
2	Wood Street South	5.1
3	Blackhorse Lane South	5.1
4	Northern Olympic Fringe	5.1
5	Town Hall	5.0
6	Walthamstow Town Centre	4.9
7	Wood Street North	4.8
8	Whipps Cross	4.8
9	South Grove / Kelmscott	4.8
10	Leytonstone	4.4

4.3 Results – preferred clusters

4.3.1 It can be seen from the cluster analysis above that the highest score achieved by any of the clusters is around 5.9 out of theoretical maximum of 10.

4.3.2 There may be other site specific factors to consider in the selection of preferred clusters to examine further in the DeMAP process, however, based on the scoring system presented here and following liaison with LBWF the top seven clusters have been taken forward to the implementation plan below. These clusters are also

displayed in Appendix A5 (drawing PEL285432A_11A (A)) and Appendix A6 at slightly higher resolution (PEL285432A_12A (A)).

4.4 Limitations of cluster analysis methodology

4.4.1 Whilst the process outlined above gives a clear and robust justification for the selection of certain schemes, the methodology also has several limitations that should be noted.

4.4.1.1 The cluster analysis process outlined above is based around a fixed number of 'satellite' loads from a central load point. In this case a figure of 5 satellite loads has been adopted. This potentially undervalues those schemes where 3 satellite loads are in close proximity but one lies further afield. Equally, it does not highlight the potential benefit of additional loads after the first five. PB recognises this limitation of the quantitative analysis, and in the implementation plan phase of analysis PB has sought to take a more flexible approach to load cluster selection, including and discarding loads from this initial analysis where it is considered appropriate, and also joining clusters where applicable. The clusters and opportunity areas resulting from this analysis have also been 'sense-checked' alongside LBWF to try to ensure that the results reflect opportunities on the ground.

4.4.1.2 The geographical analysis of loads only takes into account the linear distance of the loads from a central point. However, in terms of the cost of installation of district energy infrastructure, a linear arrangement of loads will result in a lower cost network than a group of loads arranged in a circle around the central node. This is not currently reflected in the scoring methodology.

5 IMPLEMENTATION PLAN

5.1 Scheme Scoping through to Delivery

5.1.1 There are a number of key stages that any emerging DE scheme must pass through in order to complete its passage from concept to delivery. These can be briefly summarised as follows, and are described in more detail in the 'DeMAP Support Package to Boroughs':

5.1.2 Concept Development and Support Framework (Capacity Building)

5.1.3 Initial actions at the conceptual stage include heat mapping (e.g. the output of this study), gaining support at senior political level, and generating a policy framework that is supportive of decentralised technologies. This latter is underway in LBWF with the development of decentralised-energy favourable policies within the Core Strategy.

5.1.4 Feasibility Study and Delivery Route

5.1.5 The feasibility stage of project development should seek to test a number of operational scenarios and technologies in order to optimise a scheme on an overall heat balance basis. Equally, attention should be given to the delivery and phasing of the project, to ensure that heat loads and sources are matched through project growth. Outputs of this stage would include, capital and operational cost models, summaries of carbon savings, suggestions for procurement routes, and outline network routes, plant locations and other key infrastructure required to deliver a workable scheme.

5.1.6 Some assistance for this stage of scheme development may be available from the Energy Savings Trust (EST)[6]. The EST currently has a package that may be suitable providing guidance and advice on next steps and identifying key potential obstacles to delivery.

5.2 Project Definition and Delivery

5.2.1 The delivery phase of a project is dependent upon the formulation of a workable business plan, and the identification of funding to support implementation. Project partners will require an evaluation of the risks associated with the project and mitigation strategies. A procurement strategy should be agreed, and the tendering process will confirm costs of installation.

5.3 Note on Cluster Extents

5.3.1 The drawing in Appendix A7 (PEL285432A_13 (A)) illustrates indicative DH Opportunity Areas – e.g. expanding the concept of clusters to show notional spheres of influence around clusters of heat load. These also illustrate the extent to which the clusters of the Town Hall and Wood Street North and South can be considered synergistic.

[6] http://www.energysavingtrust.org.uk/business/Business/Local-Authorities/Support-services/Practical-Help, accessed 16th February 2011.

5.4 Pipeline model results

5.4.1 Parsons Brinckerhoff has developed a 'pipeline' model that calculates indicative capital costs for a heat network. This is based only on distances between load points and an estimated peak load derived from assumed load factors at each load point. Further, pipework diameters and their costs are derived from assumptions of allowable pressure drops per metre of pipework (rather than optimising pipework sizes on a lifecycle basis including capital costs, pumping energy and heat losses). This methodology is therefore only indicative, and is included here as a preliminary tool to show the order of magnitude of capital cost that might be anticipated for the schemes identified.

5.4.2 The cost of many of the elements of a DH scheme is highly variable, depending upon local conditions, existing plant or utilities, scale, and other factors, and hence the costs included here can only be roughly indicative. However, one significant cost element of district energy schemes relates to the pre-insulated buried pipework that is the preferred heat carrier technhology. Outline average costs for this element of scheme are as follows:

Small diameter mains (25mm to 65mm internal diameters) – approx £650/m

Medium diameter mains (80mm to 150mm internal diameters) – approx £850/m

Large diameter mains (200mm – 400mm internal diameters) – approx £1,250/m

These costs are expressed as a price for installed pre-insulated pipework per meter of trench in a 'hard dig' surface, including civil works costs, reinstatement and project management.

5.4.3 Blackhorse Lane North and South

5.4.4 Blackhorse Lane is an important gateway site for LBWF, and is anticipated to be developed over the next decade. As a key connection to the Upper Lee Valley Opportunity Area, the strategic plan is to develop a new urban quarter close to both good transport links and an outstanding natural environment. The area is currently more industrial in character, bordered on the east by residential areas. As a new urban quarter, developments would be anticipated to be mixed use with retail and residential elements. This mix would provide a good balance of demands for district energy. The railway line and A503 will reduce the ease of development to the south.

5.4.5 The loads identified in these schemes are as follows – the load with the highest heat load is highlighted as the potential 'anchor load'. A detailed cluster map is displayed in Appendix A9.

Cluster	Load Name	kWh heat demand p.a.
Blackhorse Lane North	The Paper Mill Site, 24	1,205,000
	Sutherland Road, Blackhorse Lane	**1,710,179**
	Papermill Place Phase 3, 24	410,000
	Dilwyn Court	399,046
	1-2 Sutherland Road Path	248,400
	Hillyfields	383,179

Cluster	Load Name	kWh heat demand p.a.
Blackhorse Lane South	Essex Close Estate	258,122
	Willowfield High School	775,931
	Latchingdon Court	704,041
	Stoneydown Park Junior School	209,286
	Station Hub, Blackhorse Lane	**4,953,623**

5.4.6 PB has analysed two scheme configurations for Blackhorse Lane using the 'pipeline' – e.g. treating the North and South clusters separately. The initial approximation of costs and carbon savings for the schemes below are all based on a gas-fired CHP.

Scheme name	Indicative gas-fired CHP size (kWe output)	Approximate capital cost	Approximate emissions savings (tonnes CO_2 p.a.)
Blackhorse Lane North	526	£1.9m	773
Blackhorse Lane South	635	£2.1m	903

5.4.7 Wood Street (North and South Clusters)

5.4.8 The current ambitions for the Wood Street area are to strengthen the centre with a retail-led mix of uses, whilst also enhancing links to surrounding neighbourhoods. The aim will be to enhance historic assets through sensitive refurbishment of character buildings and to enhance the public realm to develop the vibrancy and vitality of the town centre. The residential element currently planned for the area will complement the retail uses in terms of heat demand profiles, and this would further be enhanced by the educational element of the schemes identified below. The loads below indicate that the key anchor loads are likely to be a new development site in the northern part of the area, but could potentially be based around the Marlow Road CHP in the South.

5.4.9 The loads identified in these schemes are as follows, displayed in Appendix A11:

Cluster	Load Name	kWh heat demand p.a.
Wood Street North	Wood Street Library	204,723
	Woodside	557,611
	Woodside Primary School	542,075
	Former Hawker Siddeley Site, Forest Works	**1,995,000**
	Frederick Bremer School	737,953

Cluster	Load Name	kWh heat demand p.a.
Wood Street South	Wood Street AAP	4,155,456
	Northwood Tower	636,863
	Wood Street Car Park	480,000
	Wood Street Goods Yard, 186	276,360
	Marlowe Road CHP (formerly Marlow Road Estate)	**4,340,452**
	Stockfield Road Estate main boiler house	1,237,891

5.4.10 As above PB has analysed two schemes for Wood Street, the North and South Cluster.

Scheme name	Indicative gas-fired CHP size (kWe output)	Approximate capital cost	Approximate emissions savings (tonnes CO_2 p.a.)
Wood Street North	294	£1.5m	498
Wood Street South	1,190	£2.8m	2,100

5.4.11 These figures indicate that the Wood Street AAP South scheme delivers a high level of carbon savings at a low capital cost. However, this must be qualified by a number of observations. First, the development of the Wood Street AAP would require lengths of district heating network to be installed that are not indicated by the single point of connection for the area regeneration as it has been modelled. E.g. the modelling carried out for this study does not reflect that the 'Wood Street AAP' load in Wood Street South is in fact a combination of many individual loads, which would require individual connection. The actual development is likely to be more fragmented than this analysis suggests. Second, there are existing CHP plant among the scheme loads which have not been taken into account in the modelling of carbon savings conducted here. These CHP plant are located in Marlow Road and consist of 2 no. 165kWe units, albeit these are understood to be currently non-operational.

5.4.12 Northern Olympic Fringe

5.4.13 The 2012 Games and Olympic Legacy are set to transform parts of East London, and the connection of the south of the borough to the Olympic site means that there is potential for growth and regeneration in this area. There is potential for expansion of the Olympic Park energy networks to supply the Northern Olympic Fringe, albeit there are significant major railway crossings to negotiate here.

5.4.14 The loads identified in this scheme are as follows, displayed in Appendix A12:

Cluster	Load Name	kWh heat demand p.a.
Northern Olympic Fringe	Leyton Orient Stadium	720,000
	Leyton Orient Football Club	237,656
	Matchroom Stadium, Leyton Orient Football Club	310,000
	SCORE Centre[7]	**1,000,000**
	Coronation Gardens, 100	328,680
	Municipal Offices	245,000

5.4.15 The results of pipeline model analysis of this scheme are as follows:

Scheme name	Indicative gas-fired CHP size (kWe output)	Approximate capital cost	Approximate emissions savings (tonnes CO_2 p.a.)
Northern Olympic Fringe	425	£1.6m	436

5.4.16 A caveat must be given against these figures as it is not clear from the data analysis carried out whether there are separate loads at the Leyton Orient Stadium that could be met by a centralised system (as is implied by the data received from the London Development Database), or if there is a duplication of data entries. If there is duplication of entries, then the results shown here will be more attractive than the actual heat loads warrant. There are also other loads that are not included in the modelling carried out that would warrant further analysis – e.g. the Fitness First, TK Maxx, Asda retail park adjacent to the A12.

5.4.17 Town Hall

5.4.18 The Town Hall scheme encompasses the area along Forest Road that is visually dominated by the Town Hall itself, and the neighbouring Waltham Forest College Building. No major redevelopment is planned in this area to PB's knowledge, and hence the loads identified for this scheme are based around existing buildings. The demands here are predominantly educational or office based, and hence it would be anticipated that thermal storage would be an important element in district heating scheme design, to mitigate against low evening and night-time heat requirements.

5.4.19 The loads identified in this scheme are as follows, displayed in Appendix A11:

Cluster	Load Name	kWh heat demand p.a.
Town Hall	The Clockworks, 656	250,000
	YMCA	1,525,182
	WFC Lowery Rd and Forest	**4,891,294**
	St Marys Junior	216,441
	Holy Family College	607,631
	Walthamstow Town Hall	1,352,821

[7] Please note that there is understood to be an existing CHP unit installed in the SCORE centre. No data has been received from the SCORE centre in terms of fuel consumption, and hence the heat demand contained here is an estimated figure.

5.4.20 The results of pipeline model analysis of this scheme are as follows:

Scheme name	Indicative gas-fired CHP size (kWe output)	Approximate capital cost	Approximate emissions savings (tonnes CO_2 p.a.)
Town Hall	1,190	£2.8m	1,712

5.4.21 This scheme appears to offer the most immediate opportunity for implementation, and also arguably the best potential for future expansion with the proximity of the Wood Street AAP loads.

5.4.22 The Town Hall currently has a non-operational CHP unit. The role that this unit could play in an emerging network will depend on further investigation, but it is possible that this 165kWe unit could help contribute low carbon heat to the network in some capacity.

5.4.23 Walthamstow Town Centre

5.4.24 Mixed use development is anticipated in this area, and as for both Wood Street and Blackhorse Lane, the mix of residential and retail sites should provide a good basis for decentralised energy schemes. The vision for the area is for a sustainable mix of uses, an improved range of retail facilities, new evening economy and improvements to Walthamstow Market.

5.4.25 The loads identified in this scheme are as follows, displayed in Appendix A10:

Cluster	Load Name	kWh heat demand p.a.
Walthamstow Town Centre	1-8 Tower Mews	285,000
	Central Library	205,738
	Walthamstow Station Car park	**1,016,382**
	Arcade Site	855,258
	Goddarts House	332,000
	Progress House	495,000

5.4.26 The results of pipeline model analysis of this scheme are as follows:

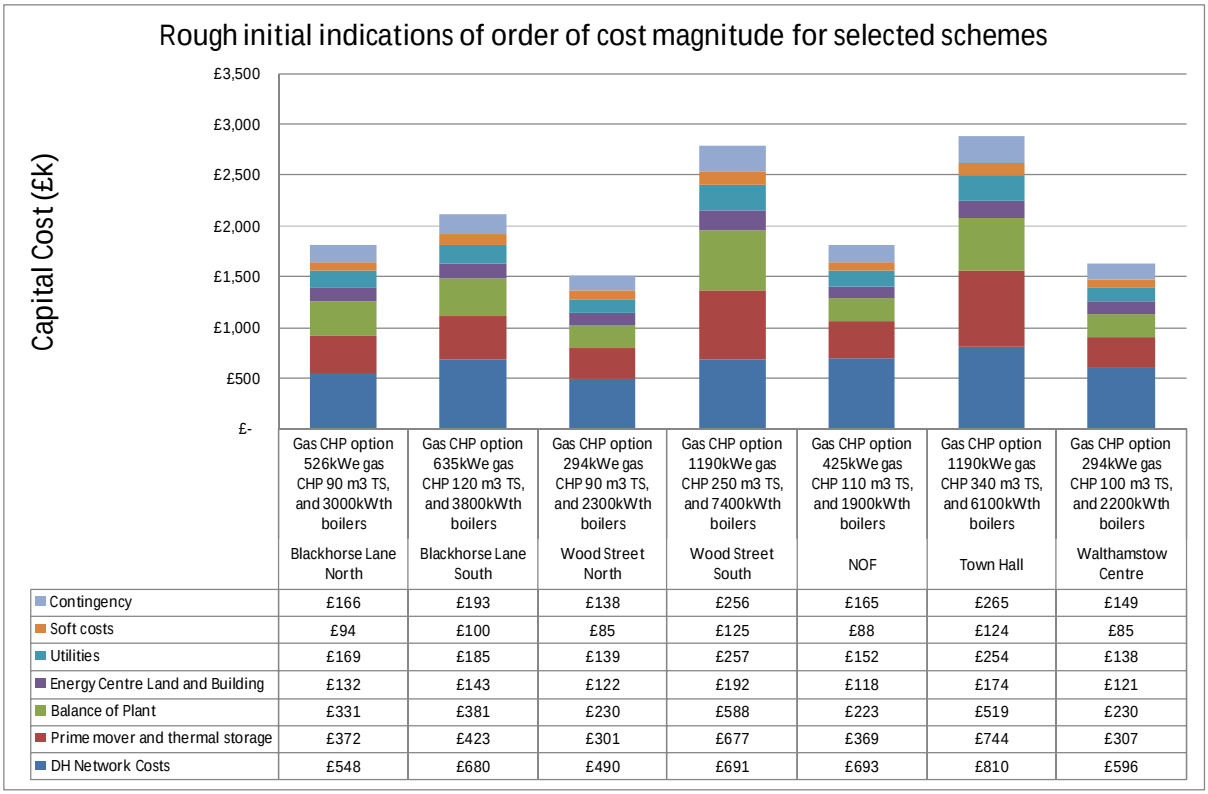
Scheme name	Indicative gas-fired CHP size (kWe output)	Approximate capital cost	Approximate emissions savings (tonnes CO_2 p.a.)
Walthamstow Town Centre	294	£1.6m	523

5.4.27 In the High Street area, a significant portion of viable existing loads are retail-based. Many existing premises in this sector are resistant to district heating solutions as there can be a conflict of space requirements between required plant areas (for heat exchangers etc.) and retail space. Many outlets also have a history of electrical heating and cooling, and have established contracts offering competitive tariffs. However, the majority of new development in this area will be mixed use. For example, the Arcade Site is proposed to include residential, leisure, and retail elements; the Station Car park development is proposed as a mixed use scheme

including a hotel; the South Grove development is anticipated to be a mixed residential / retail scheme. These mixes will offer a good balance of loads for district heating development.

5.4.28 Goddarts House has an existing CHP unit of 13kWe capacity. This is a scale that could not significantly contribute to a district energy scheme, and hence it has not been taken into account further.

5.5 Rough Initial Indication of Order of Cost Magnitude for Selected Schemes



	Gas CHP option 526kWe gas CHP 90 m3 TS, and 3000kWth boilers Blackhorse Lane North	Gas CHP option 635kWe gas CHP 120 m3 TS, and 3800kWth boilers Blackhorse Lane South	Gas CHP option 294kWe gas CHP 90 m3 TS, and 2300kWth boilers Wood Street North	Gas CHP option 1190kWe gas CHP 250 m3 TS, and 7400kWth boilers Wood Street South	Gas CHP option 425kWe gas CHP 110 m3 TS, and 1900kWth boilers NOF	Gas CHP option 1190kWe gas CHP 340 m3 TS, and 6100kWth boilers Town Hall	Gas CHP option 294kWe gas CHP 100 m3 TS, and 2200kWth boilers Walthamstow Centre
Contingency	£166	£193	£138	£256	£165	£265	£149
Soft costs	£94	£100	£85	£125	£88	£124	£85
Utilities	£169	£185	£139	£257	£152	£254	£138
Energy Centre Land and Building	£132	£143	£122	£192	£118	£174	£121
Balance of Plant	£331	£381	£230	£588	£223	£519	£230
Prime mover and thermal storage	£372	£423	£301	£677	£369	£744	£307
DH Network Costs	£548	£680	£490	£691	£693	£810	£596

The cost categories shown in the diagram above represent the following:

Contingency – an allowance allocated to project budgets to cater for unforeseen circumstances and cost increases.

Soft costs – including design fees, application fees

Utilities – the costs associated with supplying the energy centre with fuel (e.g. natural gas), electricity, water and telecommunications.

Energy Centre Land and Building – the cost to procure the land upon which the energy centre will be built and the cost of construction of the energy centre itself (excluding plant)

Balance of Plant – incorporating items such as boiler plant, ventilation, pressurisation plant, system expansion vessels, pumps, filtration units, gas boosters, controls, and other sundries.

Prime mover and thermal storage – the primary heat supply technology (i.e. in these examples the gas-fired reciprocating engine units selected) and the hot water storage vessels.

DH Network Costs – the district heating network installation costs including design, excavation, installation, reinstatement and project management.

5.6 Implementation Plan – Next Steps

Site reference	DE Opportunity Name	Priority	Notes	Barriers	Next Steps	Key Dates and Delivery Milestones	Responsible Person
		Low, medium, high	Outline description of scheme	Barriers to delivery	In terms of LA facilitation of progress	(if action is not taken will the project be delayed)	
	Borough Wide			Need a lead organisation to show community leadership for DE	Council to decide whether its wants to take an active or passive role in the facilitation of DE and what level of community leadership it can show for DE, e.g. in the creation of ESCOs / MUSCOs, etc. Strengthen joint working with other key regional/sub-regional organisations. Protect communal heating systems within the borough and avoid any decommissioning of existing communal heating systems.	<u>Delivery Milestones include:</u> Decision by Council on level of involvement. Ongoing liaison. Identify funding for feasibility studies.	Head of Spatial Planning Head of Regeneration Climate Change Lead

Site reference	DE Opportunity Name	Priority	Notes	Barriers	Next Steps	Key Dates and Delivery Milestones	Responsible Person
		Low, medium, high	Outline description of scheme	Barriers to delivery	In terms of LA facilitation of progress	(if action is not taken will the project be delayed)	
1 & 3	Blackhorse Lane (North and South Clusters)	Medium	Important gateway regeneration area for up to 2,000 new homes, employment (1,000 new jobs). Development anticipated over next decade. Key future heat loads here include the Station Hub development area, the Sutherland Road area and the Paper Mill Sites. The projected total heat load for the area is 11GWh per year. This cluster is important for the Upper Lea Valley (ULV) Decentralised Energy Network (DEN), as identified in the Energy Strategy for the ULV. The North London Strategic Alliance together with LB Enfield, LB Haringey and LB Waltham Forest and the LDA/GLA are undertaking a pre-feasibility study on establishing a DE network in this wider opportunity area.	Key loads with significant demand are future development – there are no significant existing public sector demands to act as anchor loads to base a scheme around.	Ensure that strong LDF and AAP policies are in place to ensure that heat networks are both required in development, and also to connect to neighbouring existing loads. Carry out feasibility level study to develop outline designs and determine viability. Work with local partners including the North London Strategic Alliance, the LDA, the North London Waste Authority, LB Haringey and LB Enfield to establish a cross-borough DE network in the ULV. Continue to work with the ULV DEN Steering Group in establishing the ULV DEN. Where planning applications are granted in proximity to this area, future connections of development should be secured through Section 106 Agreements and Planning Conditions.	Timing dictated primarily by development timeframes. <u>Delivery Milestones include:</u> Adoption of AAP for Blackhorse Lane. Completion of Pre-Feasibility Study for ULV DEN. Future planning applications for large-scale developments within the area require to connect to future network and/or secure financial contribution.	Head of Spatial Planning AAP Lead Officer Development Management Team Leader Regeneration Lead Officer Climate Change Lead Officer

Site reference	DE Opportunity Name	Priority	Notes	Barriers	Next Steps	Key Dates and Delivery Milestones	Responsible Person
		Low, medium, high	Outline description of scheme	Barriers to delivery	In terms of LA facilitation of progress	(if action is not taken will the project be delayed)	
2 & 7	Wood Street AAP (North and South Clusters)	Medium	Up to 1,000 new homes are anticipated in this area, and other redevelopment plans include the Library site, Wood Street Precinct, and the public realm. Total heat load is estimated at 15 GWh, and a key existing heat load is the Marlowe Rd estate. The Stockfield Road should also be considered in further development of this scheme, as should connection to the Town Hall cluster identified. Most of the redevelopment sites within the Wood Street are within Council ownership.	The Marlowe Rd estate has a currently non-operational existing CHP facility. Funding needs to be secured for feasibility work.	Investigate potential sites for a new energy centre – is there space in the existing Marlowe Road plant room? Potential for redevelopment of Marlow Road Estate/Precinct area to incorporate mixed developments and energy centre. Liaise with Ascham Homes to discuss collaboration. Where planning applications are granted in proximity to this area, future connections of development should be secured through Section 106 Agreements and Planning Conditions. Carry out feasibility level study to develop outline designs and determine viability.	Timing dictated primarily by development timeframes. <u>Delivery Milestones include:</u> Application of the Energy Masterplanning Toolkit (developed by the Haringey Low Carbon Zone). Completion of feasibility study. Adoption of AAP for Wood Street. Future planning applications for large-scale developments within the area require to connect to future network and/or secure financial contribution	Head of Spatial Planning AAP Lead Officer Development Management Team Leader Regeneration Lead Officer Climate Change Lead Officer Asham Homes, Head of Asset Management (Andrew Marsh)

Site reference	DE Opportunity Name	Priority	Notes	Barriers	Next Steps	Key Dates and Delivery Milestones	Responsible Person
		Low, medium, high	Outline description of scheme	Barriers to delivery	In terms of LA facilitation of progress	(if action is not taken will the project be delayed)	
4	Northern Olympic Fringe	Medium	Regeneration of this area could provide up to 2,500 new homes. Key linkages to the Olympic Park. Key heat loads identified here include Leyton Orient Stadium, and the Score Centre. Development of networks here should also include considering links to the Leyton Mills site and possibly to other locations – e.g. Essex Wharf site, Lee Valley Ice Centre, Lea Bridge Station, Argall Industrial Estate, Lea Bridge Road and Lea Valley Park, although the distances to these may be too great.	The Northern Olympic Fringe covers a large geographical area – linkages between some loads will be expensive in infrastructure terms. Some existing retail units will also have established means of heat provision leading to inertia. Railway line as physical barrier to be overcome to connect to Olympic energy network. Financial implications associated with this barrier.	Continue dialogue with Cofely – (Olympic Park concessionaires for energy provision). Continue dialogue with Leyton Mills developers. Should the desired new Leyton footbridge into the Olympic park be taken forward, it should be designed to facilitate connection to the Olympic energy network. Where planning applications are granted in proximity to this area, future connections of development should be secured through Section 106 Agreements and Planning Conditions. Carry out feasibility level study to develop outline designs and determine viability.	Timing dictated primarily by development timeframes and potentially influenced by availability of waste heat from Olympic Park. <u>Delivery Milestones include:</u> Application of the Energy Masterplanning Toolkit (developed by the Haringey Low Carbon Zone) Completion of pre-feasibility study Adoption of AAP for Northern Olympic Fringe Future planning applications for large-scale developments within the area require to connect to future network and/or secure financial contribution	Head of Spatial Planning AAP Lead Officer Development Management Team Leader 2012 Programme Manager Regeneration Lead Officer Climate Change Lead Officer Cofeley Business Development Manager (Mark Covington)

Site reference	DE Opportunity Name	Priority	Notes	Barriers	Next Steps	Key Dates and Delivery Milestones	Responsible Person
		Low, medium, high	Outline description of scheme	Barriers to delivery	In terms of LA facilitation of progress	(if action is not taken will the project be delayed)	
5	Town Hall	High	Existing building included within this scheme are: the Town Hall, YMCA, Waltham Forest College, Holy Family College and St Mary's Junior School. Waltham Forest College has the most significant heat demand of these existing buildings, and hence its participation in the scheme will be essential . Consideration should also be given to linking this scheme to the Wood Street AAP clusters identified.	YMCA currently planning new boiler installation. Town Hall CHP not operating. Technical and financial viability to be established.	Carry out feasibility level study to develop outline designs and determine viability. Town Hall CHP may need replacement. Funding needed for feasibility study to restart existing CHP and create local DE network. Continued active dialogue with YMCA and Waltham Forest College about boiler replacement, plans, and phasing. Where planning applications are granted in proximity to this area, future connections of development should be secured through Section 106 Agreements and Planning Conditions	Recommendation is to move this project forward as soon as possible to benefit from YMCA avoided costs. Completion of Feasibility Study Funding bid for local network, potentially to London Green Fund	Climate Change Lead Council: Assets Special Projects Manager YMCA Contracts, Services & Utilties Manager (Paula Fogg) Waltham Forest College Facilities Manager (Margaret Gallagher)

Site reference	DE Opportunity Name	Priority	Notes	Barriers	Next Steps	Key Dates and Delivery Milestones	Responsible Person
		Low, medium, high	Outline description of scheme	Barriers to delivery	In terms of LA facilitation of progress	(if action is not taken will the project be delayed)	
6	Walthamstow Town Centre	Medium	Regeneration of the Town Centre could provide up to 2,000 new homes and other mixed uses, improved retail facilities. The vision is of a vibrant, sustainable Town Centre. Key heat loads include the regenerated Station Car Park site and the Arcade site. Other important private sector loads that should be included in subsequent stages of investigation include the Selborne Walk Shopping Centre. Station car park planning application approved in principle in January 2011 has agreed to connect to a future local DE network.	Inertia in existing retail sector to installation of DH. Railway crossing. Funding needed for feasibility study.	Ensure that strong policies are in place to ensure that heat networks are both required in development, and also to connect to neighbouring existing loads. Where planning applications are granted in proximity to this area, future connections of development should be secured through Section 106 Agreements and Planning Conditions. Carry out feasibility level study to develop outline designs and determine viability.	Timing dictated primarily by development timeframes. <u>Delivery Milestones include:</u> Application of the Energy Masterplanning Toolkit (developed by the Haringey Low Carbon Zone). Completion of pre-feasibility study. Adoption of AAP for Walthamstow Town Centre . Future planning applications for large-scale developments within the area require to connect to future network and/or secure financial contribution.	Head of Spatial Planning AAP Lead Officer Development Management Team Leader Regeneration Lead Officer Climate Change Lead Officer

6 CONCLUSIONS AND RECOMMENDATIONS

6.1 Conclusions

6.1.1 This project's primary aims were to collate data of (existing and future) heat demands within the London Borough of Waltham Forest, and to use this information to identify high-level opportunities for decentralised energy deployment.

6.1.2 LBWF has been thorough in gathering data from a wide variety and breadth of sources. A large number of data points have been analysed and displayed on a variety of GIS maps.

6.1.3 It can be seen from the map that displays all of the identified loads of over 200MWh/year (Appendix A4) that despite the breadth of the data collection phase of this project, there are relatively few dense clusters of high heat demand.

6.1.4 However, some areas would appear to offer good potential for the linking of energy nodes to improve overall efficiency of heat delivery and PB has identified some of these opportunities in this report.

6.1.5 The main opportunity clusters that are identified are the following:

- Blackhorse Lane (North and South clusters)
- Wood Street (North and South clusters)
- Northern Olympic Fringe
- Town Hall
- Walthamstow Town Centre

6.2 Recommendations

6.2.1 PB recognises the critical role that district heating can play in the transition towards a low-carbon economy. Waltham Forest houses a large number of businesses and residents in a fairly concentrated area, and hence is an opportunity area for the deployment of district heating in the future.

6.2.2 This study aims to highlight a number of areas where the viability of district heating deployment is likely to be greatest, and therefore provide 'stepping stones' to wider area schemes.

6.2.3 Where potential has been identified for the emergence of a standalone district energy system, key next steps will include a series of further levels of feasibility / viability investigations to increase confidence levels for all stakeholders in the realism of delivery. An example of the progression of these studies is as follows:

Technical options appraisal – This would typically focus on a single cluster of loads, and set out to gather detailed (profiled) energy use and energy cost information, such that detailed plant sizing and outline cost analysis can be carried out. This study would identify forecast capital costs from outline quotations, and would show what level of overall life cycle cost savings could be expected from the installation of a number of variant plant configurations. This should lead to the selection of a least-

cost option to carry forward. This study should also identify any additional loads not identified in this report that could contribute towards the formation of a viable network. Where appropriate, consideration of future-proofing to allow for system expansion should also be incorporated into the study.

The identification of a least-cost (technical) delivery option and overall capital costs should then allow a business-case model to emerge. This would be based upon the key stakeholders' choice of delivery vehicle, and the business model would focus on the level of funding required to bring the scheme to fruition and the level of contribution that could be expected from third-party energy services companies / multi-utility service companies (if this is the selected model for delivery).

At both of these key stages, the involvement of potential heat customers and regular stakeholder engagement is recommended, in order to increase the likelihood of eventual connection of prospective heat customers, and also such that the scheme designers are aware of any key drivers for individual customers and can design accordingly.

Further stages in scheme delivery would include:

- Tendering / Procurement
- Detailed design
- Construction / Supervision
- On-going operation and monitoring

6.2.4 Feasibility work should also address the potential to link up decentralised energy schemes, to allow all customers to benefit from economies of scale. This is particularly relevant to the Town Hall and Wood Street schemes, where their proximity could allow for a single energy centre to be built in a modular fashion.

6.2.5 It is very difficult to provide concrete recommendations on the viability or feasibility of connection of loads on a generalised basis as there are many variable factors that influence feasibility. The key to successful delivery of DH schemes lies in feasibility assessments on an individual basis that illustrate the business opportunity that the schemes offer. However, on the assumption that district energy is seen as a key means of delivering a reduced environmental burden in the future, it is appropriate to recommend that all developments above a certain scale, say 10 dwellings, are made compatible with district heating systems. This might include specifying maximum return temperatures on communal systems, and ensuring that a single point of connection is available to 'plug in' a new district heating supply. This aspect of design is addressed in the Preferred Options Development Management Policies DM12 (C).

6.2.6 In this context, it is important for LBWF to take the policy lead in ensuring that where there is scope for intervention, that policy encourages, or even demands the refurbishment / installation / maintenance of systems that are DH compatible. This might include preventing the installation of electric heating systems where a low temperature hot water ('wet system') can continue to operate.

6.2.7 Most of the clusters identified here include future development; hence a key recommendation for LBWF is to ensure that developers are aware of the potential emergence of these decentralised energy schemes, so that they can start to consider the benefits that this solution might bring.

6.2.8 Developers should be obligated to commit to connect to (existing or future) DE networks or demonstrate why they should not connect or help develop a decentralised energy scheme for their developments.

6.2.9 LBWF's emerging Core Strategy policies and Development Management policies provide a first stepping stone towards establishing requirements for decentralised energy in the borough. The emerging AAPs represent an opportunity to integrate aspirations for DE networks with the spatial vision and this is a critical juncture for setting a more detailed policy framework for driving DE forward within Waltham Forest.

7 APPENDICES

7.1 Appendix A - Drawings Accompanying Report

This appendix contains drawings for display at A3 for readability, in the following order:

Appendix A1 – Existing Domestic Heat Demands

Appendix A2 – Existing Public Sector Heat Demands

Appendix A3 – Future Development Heat Demands

Appendix A4 – Combined Map (All Heat Demands)

Appendix A5 – Top 7 Clusters

Appendix A6 – Top 7 Clusters (larger scale)

Appendix A7 – Illustrative Opportunity Areas

Appendix A8 – Top 20 Clusters

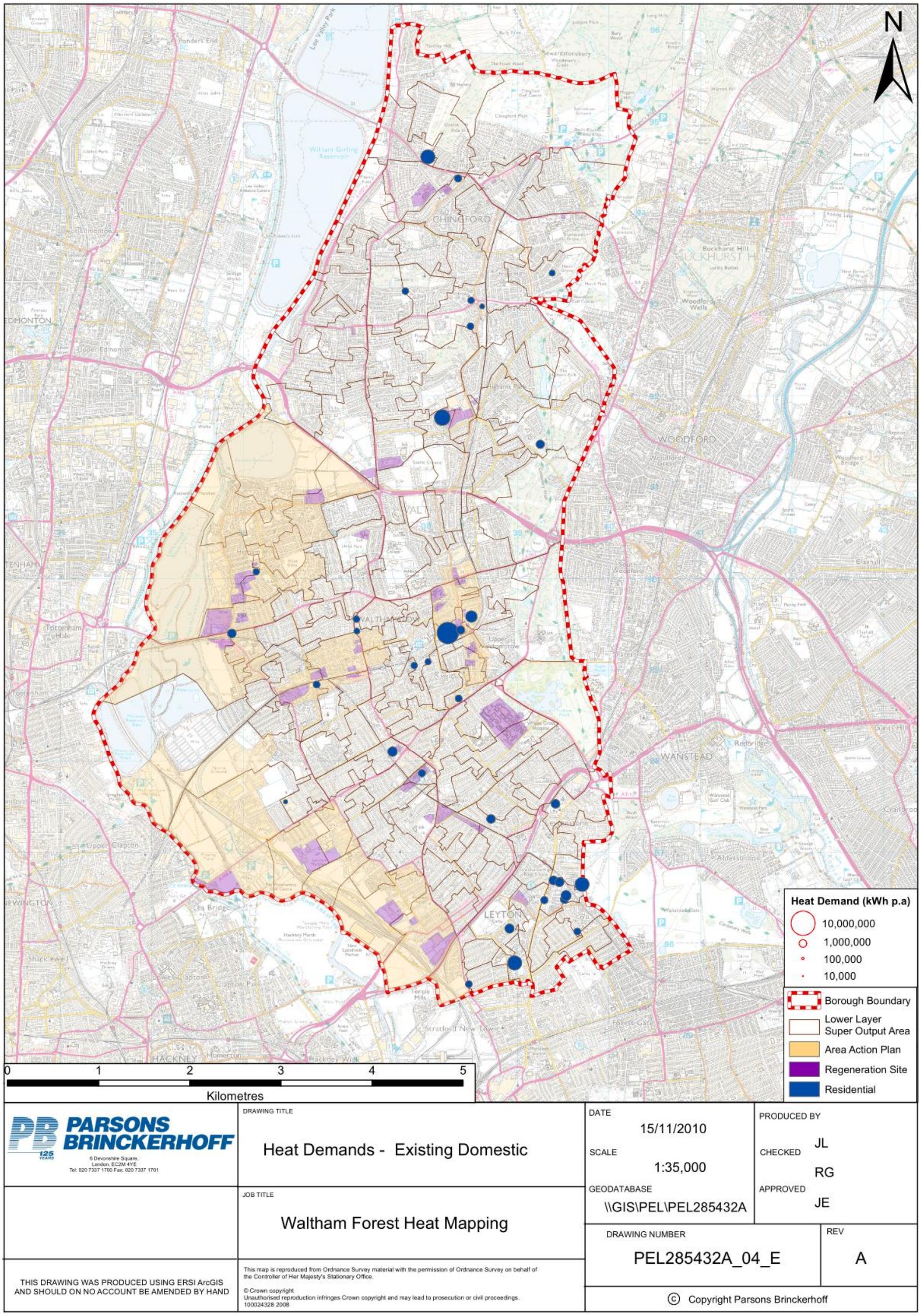
Appendix A9 – Blackhorse Lane Clusters Detail

Appendix A10 – Walthamstow Town Centre Cluster Detail

Appendix A11 – Town Hall and Wood Street Clusters Detail

Appendix A12 – Northern Olympic Fringe Cluster Detail

7.1.1 Appendix A1 – Existing Domestic Heat Demands



PB PARSONS BRINCKERHOFF
6 Devonshire Square, London, EC2M 4YE
Tel: 020 7337 1700 Fax: 020 7337 1701

DRAWING TITLE
Heat Demands - Existing Domestic

JOB TITLE
Waltham Forest Heat Mapping

DATE 15/11/2010
SCALE 1:35,000
GEODATABASE \\GIS\PEL\PEL285432A
PRODUCED BY JL
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APPROVED JE
DRAWING NUMBER PEL285432A_04_E
REV A

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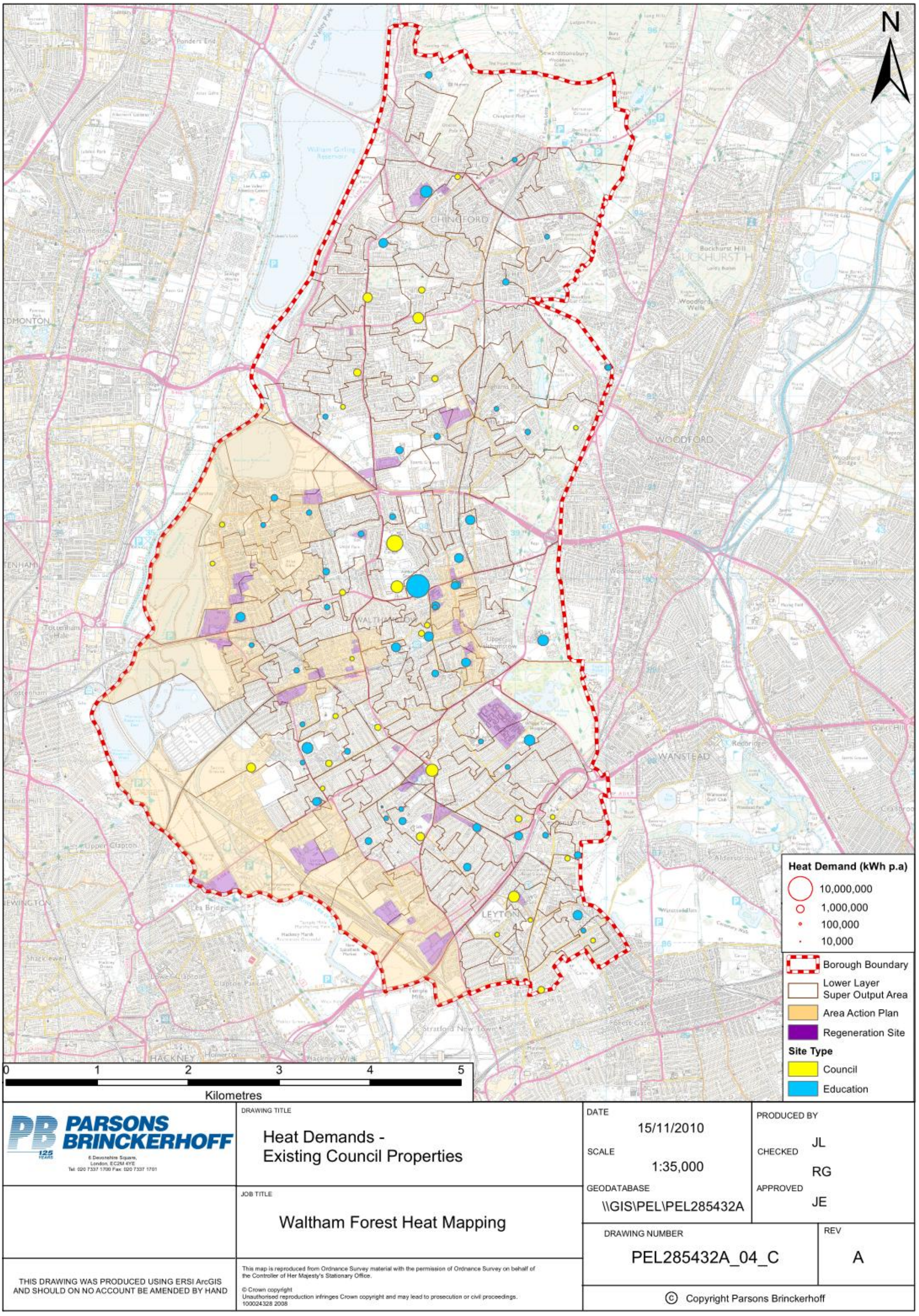
7.1.2 Appendix A2 – Existing Public Sector Heat Demands


N
Heat Demand (kWh p.a)
10,000,000
1,000,000
100,000
10,000
Borough Boundary
Lower Layer Super Output Area
Area Action Plan
Regeneration Site
Site Type
Council
Education
0 1 2 3 4 5
Kilometres
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DRAWING TITLE
Heat Demands - Existing Council Properties
JOB TITLE
Waltham Forest Heat Mapping
DATE
15/11/2010
SCALE
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GEODATABASE
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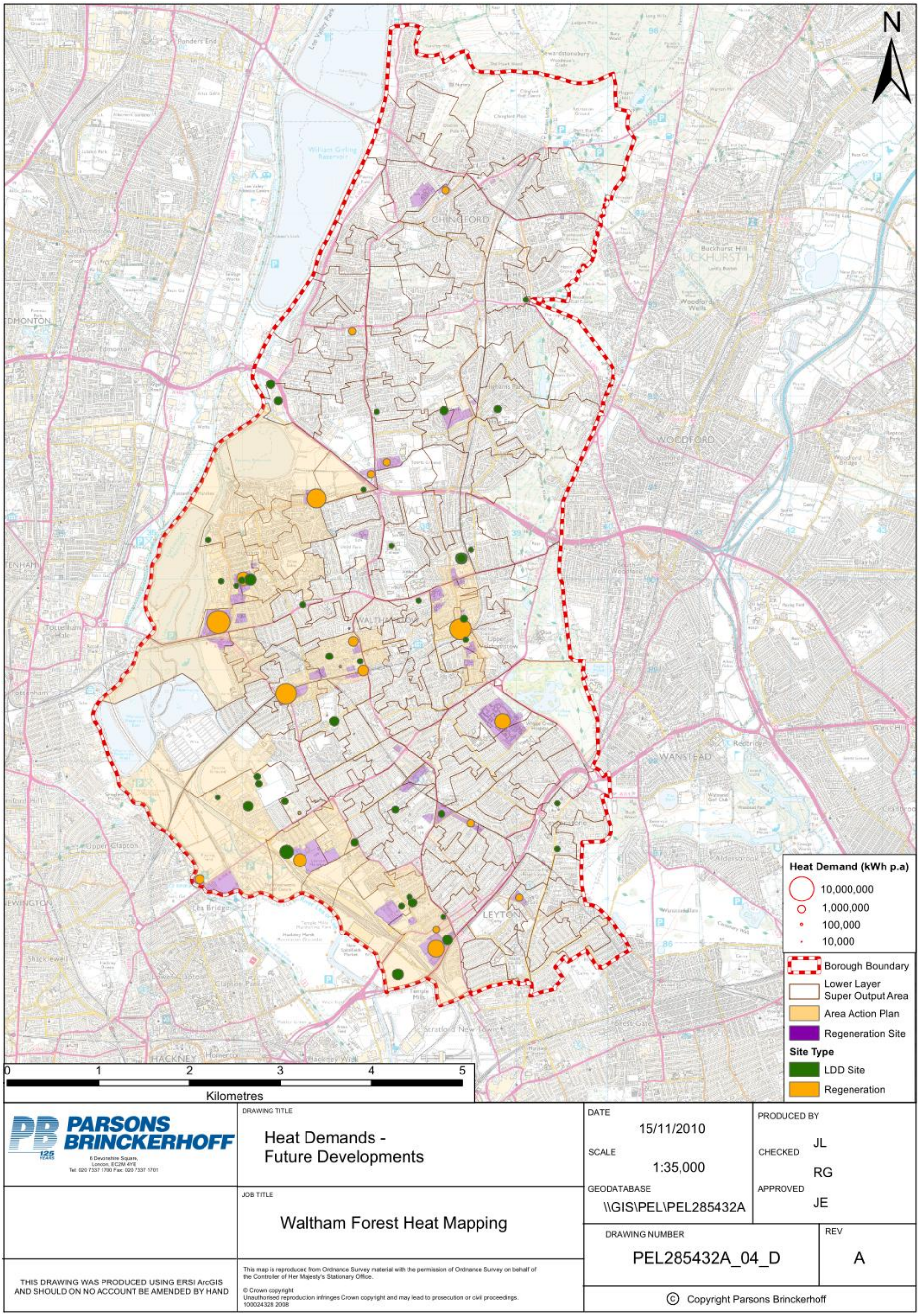
7.1.3 Appendix A3 – Future Development Heat Demands



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DRAWING TITLE
Heat Demands - Future Developments

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Waltham Forest Heat Mapping

DATE 15/11/2010
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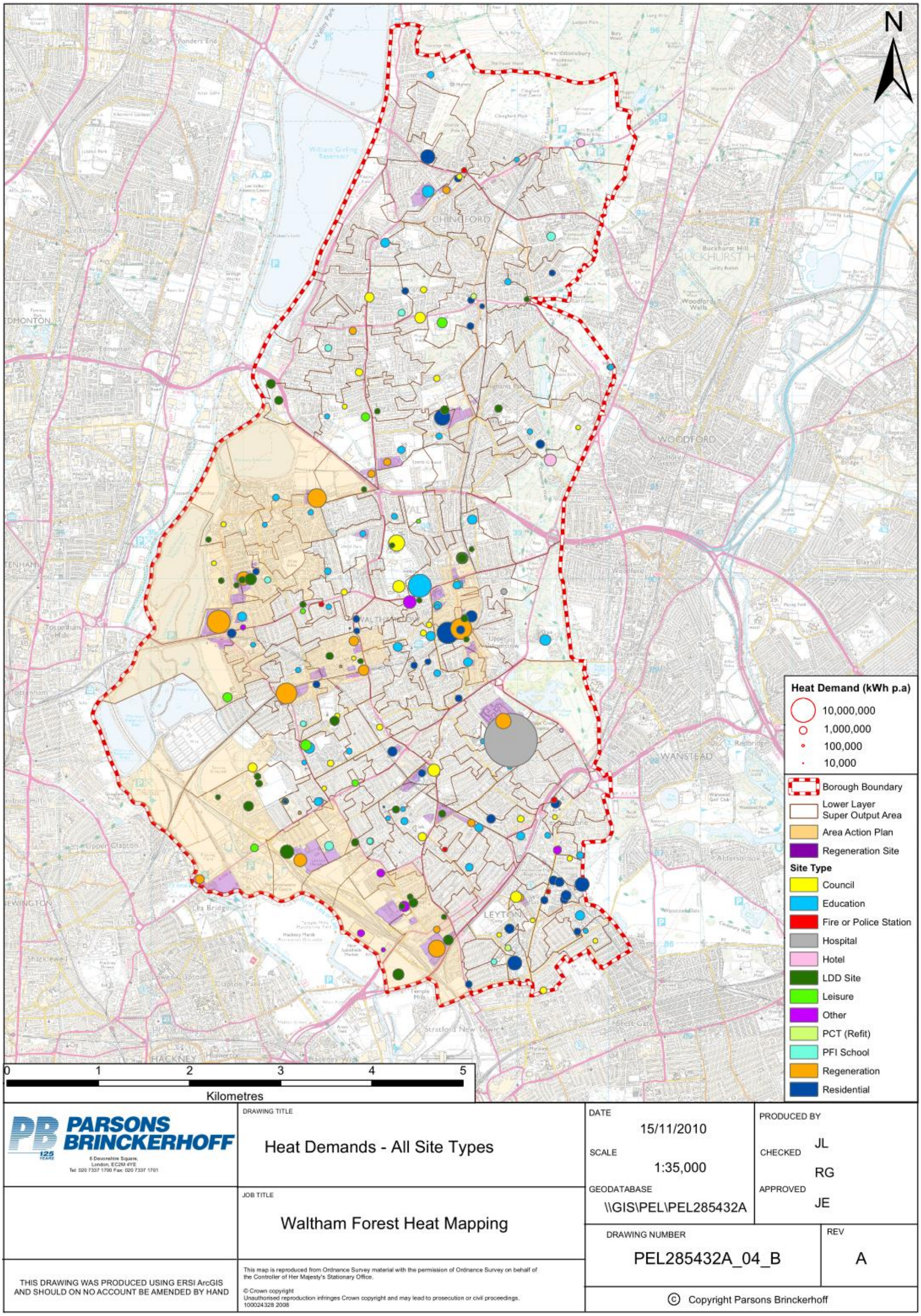
7.1.4 Appendix A4 – Combined Map (All Heat Demands)



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DRAWING TITLE
Heat Demands - All Site Types

JOB TITLE
Waltham Forest Heat Mapping

DATE 15/11/2010
SCALE 1:35,000
GEODATABASE \\GIS\PEL\PEL285432A

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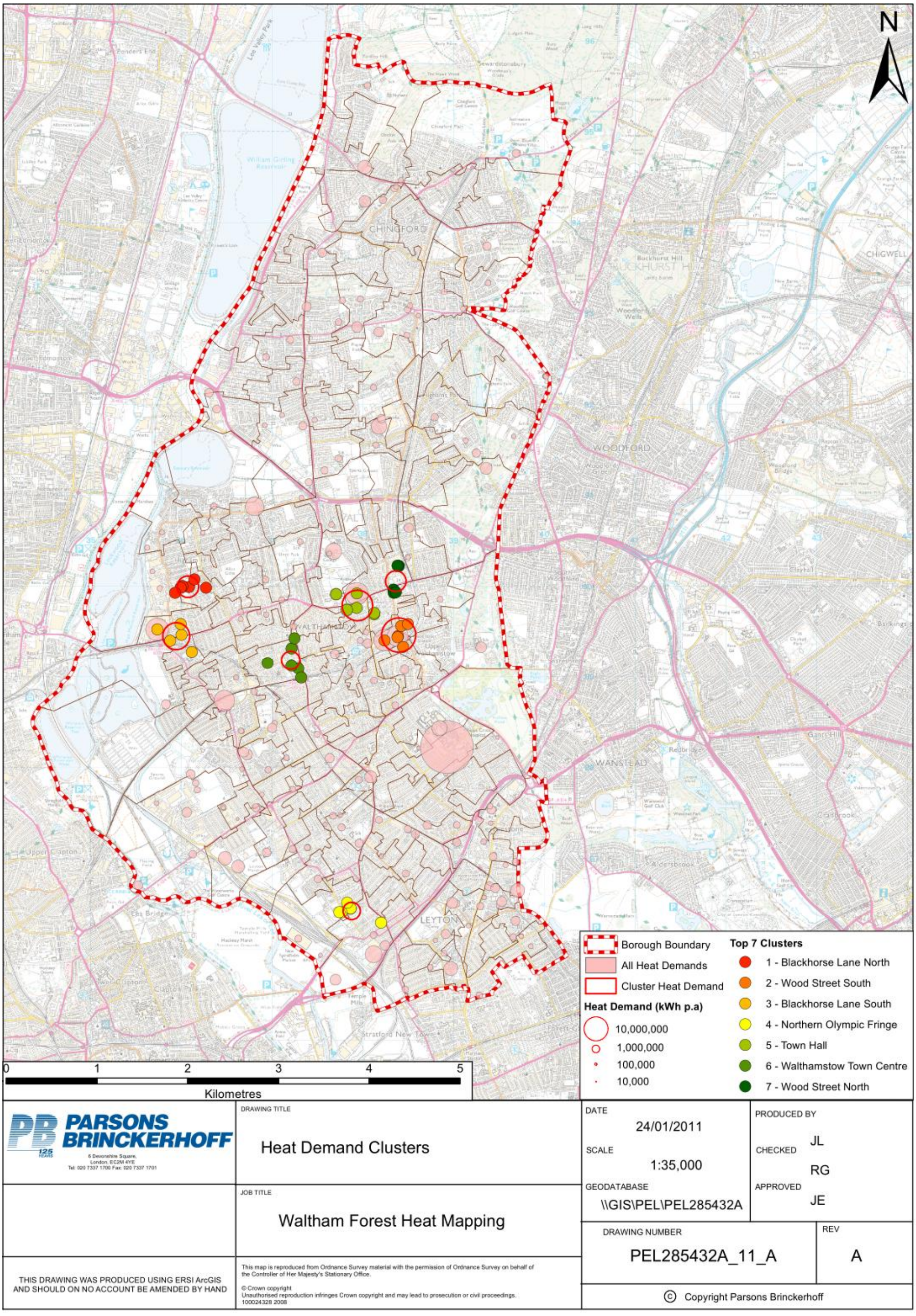
7.1.5 Appendix A5 – Top 7 Clusters


N
Borough Boundary
All Heat Demands
Cluster Heat Demand
Heat Demand (kWh p.a)
10,000,000
1,000,000
100,000
10,000
Top 7 Clusters
1 - Blackhorse Lane North
2 - Wood Street South
3 - Blackhorse Lane South
4 - Northern Olympic Fringe
5 - Town Hall
6 - Walthamstow Town Centre
7 - Wood Street North
0 1 2 3 4 5
Kilometres
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DRAWING TITLE
Heat Demand Clusters
JOB TITLE
Waltham Forest Heat Mapping
DATE
24/01/2011
SCALE
1:35,000
GEODATABASE
\\GIS\PEL\PEL285432A
PRODUCED BY
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DRAWING NUMBER
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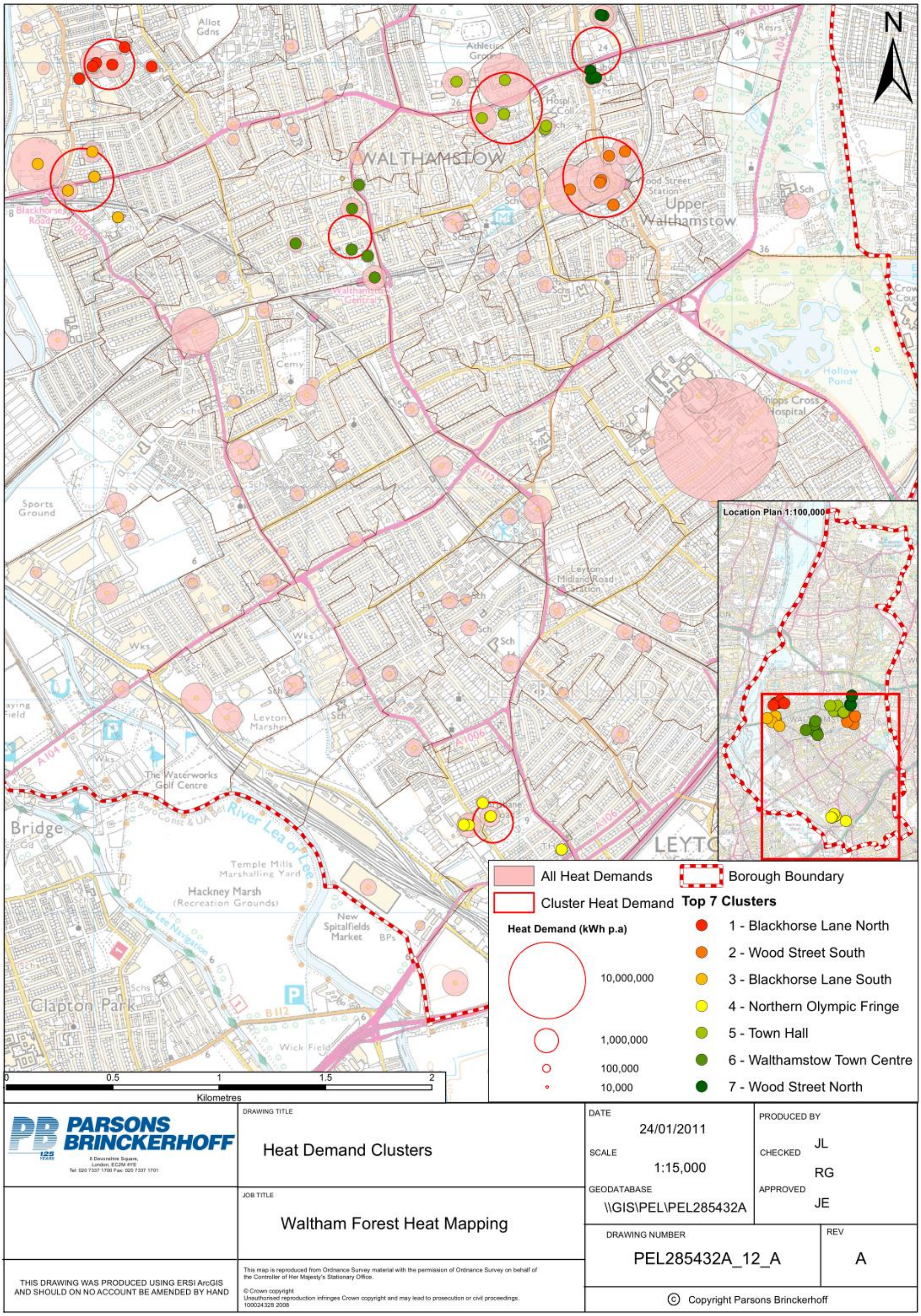
7.1.6 Appendix A6 – Top 7 Clusters (larger scale)



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DRAWING TITLE: Heat Demand Clusters

JOB TITLE: Waltham Forest Heat Mapping

DATE: 24/01/2011
SCALE: 1:15,000
GEODATABASE: \\GIS\PEL\PEL285432A
PRODUCED BY: JL
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DRAWING NUMBER: PEL285432A_12_A
REV: A

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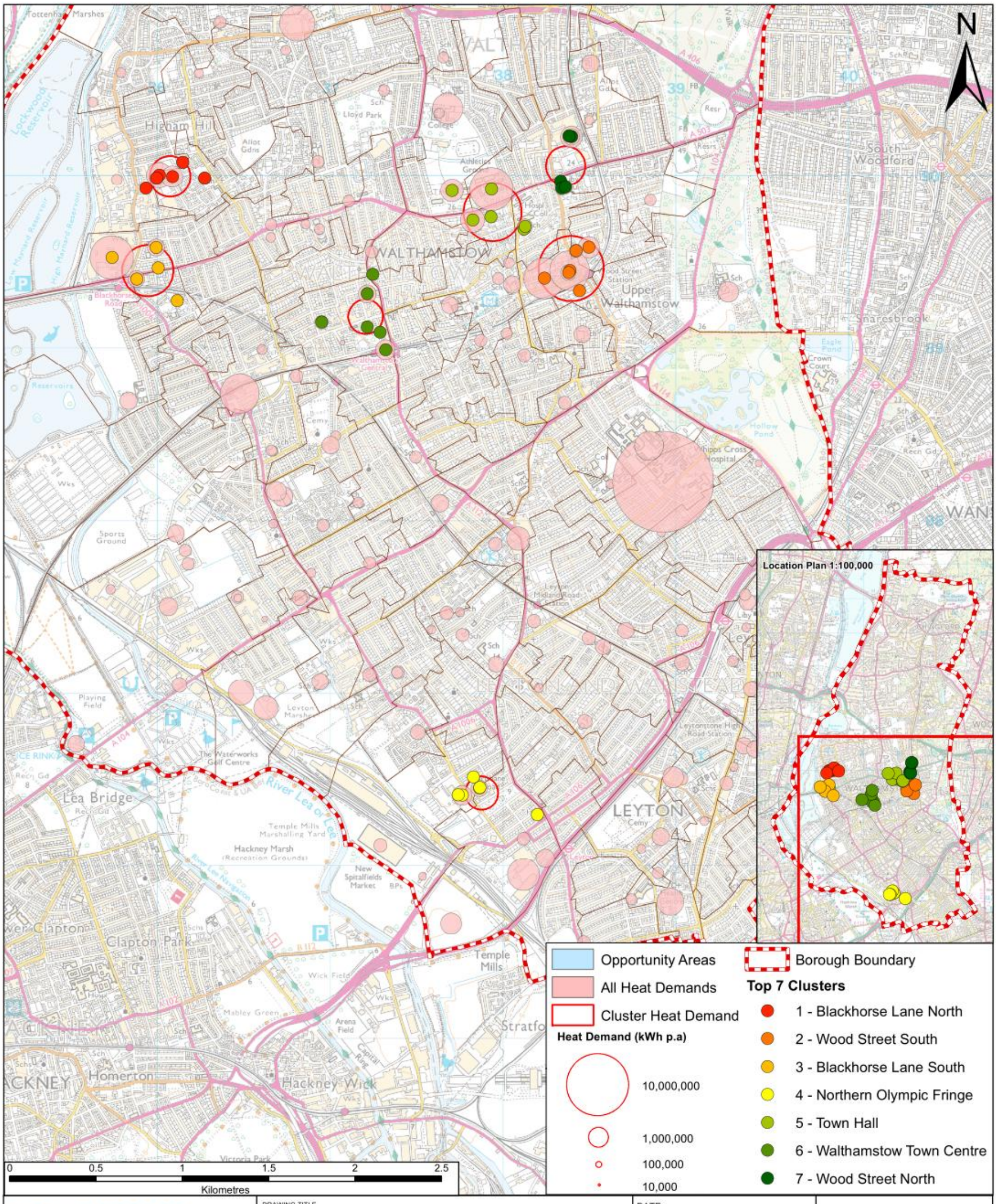
7.1.7 Appendix A7 – Illustrative Opportunity Areas



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DRAWING TITLE: District Heating Opportunity Areas

JOB TITLE: Waltham Forest Heat Mapping

DATE: 28/01/2011
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PRODUCED BY: JL
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APPROVED: JE
DRAWING NUMBER: PEL285432A_13
REV: A

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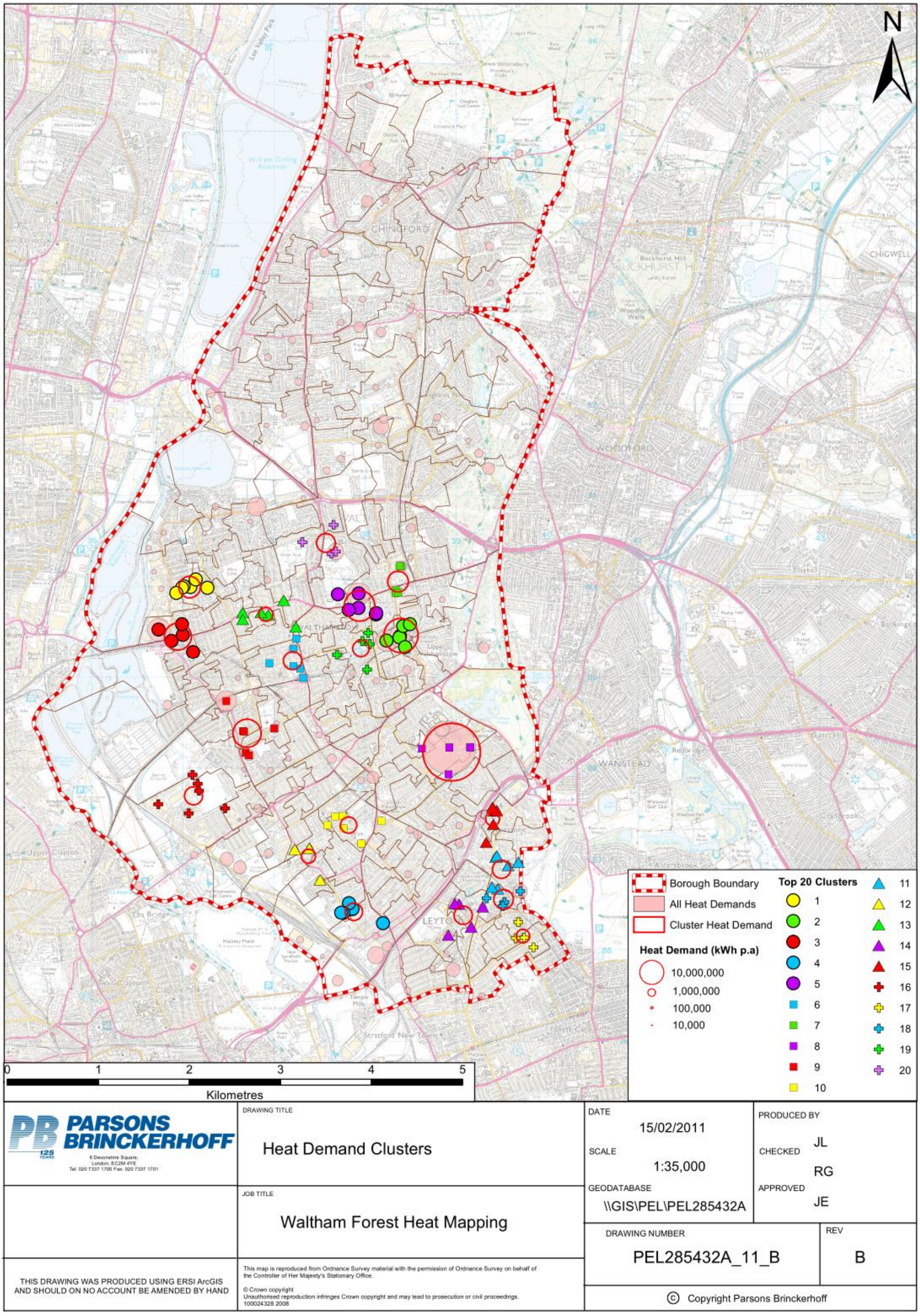
Appendix A8 – Top 20 Clusters



PARSONS BRINCKERHOFF
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Tel: 020 7337 1700 Fax: 020 7337 1701

DRAWING TITLE
Heat Demand Clusters

JOB TITLE
Waltham Forest Heat Mapping

DATE
15/02/2011

SCALE
1:35,000

GEODATABASE
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DRAWING NUMBER
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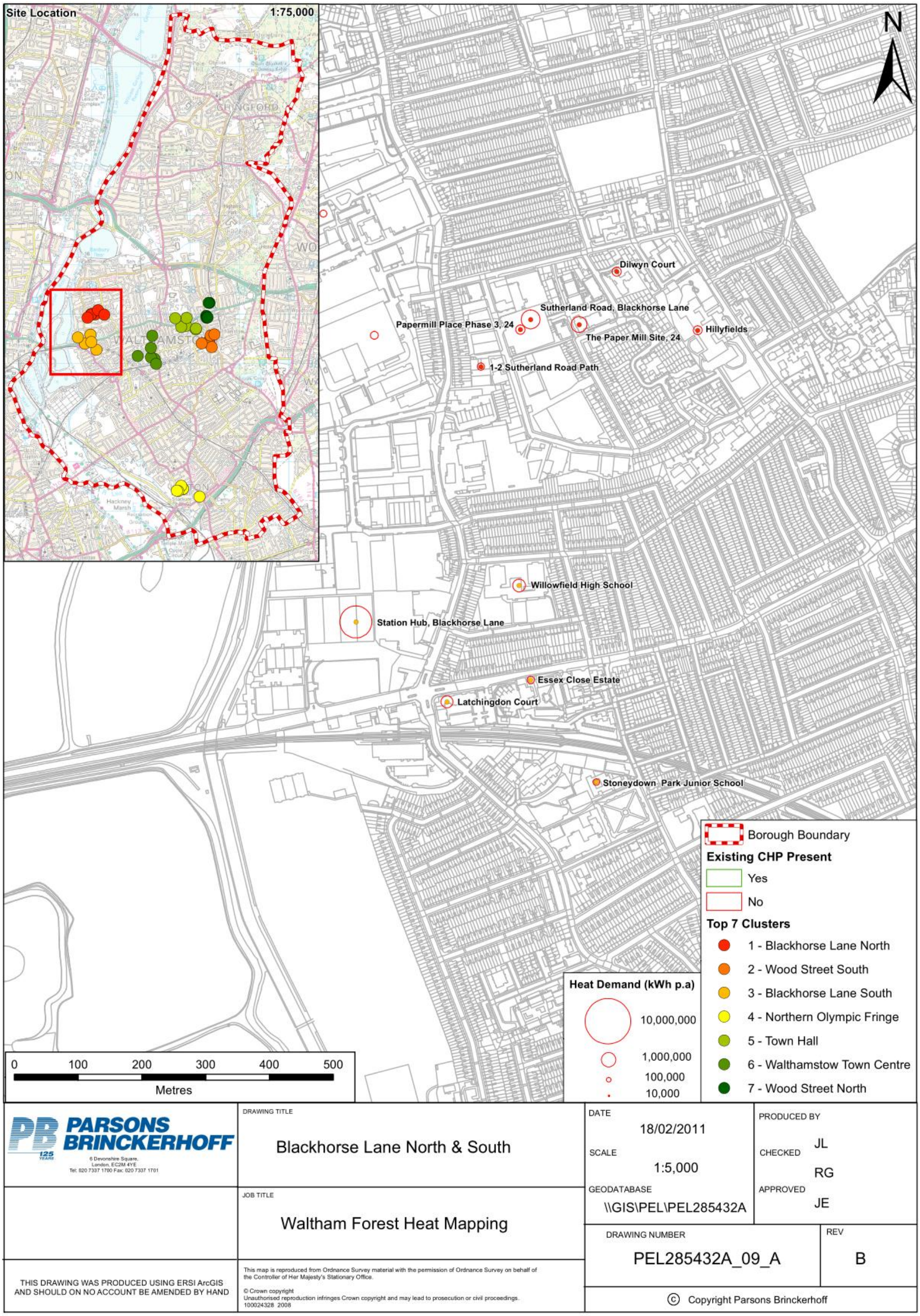
Appendix A9 – Blackhorse Lane Clusters Detail


Site Location
1:75,000
N
Dilwyn Court
Sutherland Road, Blackhorse Lane
Papermill Place Phase 3, 24
The Paper Mill Site, 24
Hillyfields
1-2 Sutherland Road Path
Willowfield High School
Station Hub, Blackhorse Lane
Essex Close Estate
Latchingdon Court
Stoneydown Park Junior School
Borough Boundary
Existing CHP Present
Yes
No
Top 7 Clusters
1 - Blackhorse Lane North
2 - Wood Street South
3 - Blackhorse Lane South
4 - Northern Olympic Fringe
5 - Town Hall
6 - Walthamstow Town Centre
7 - Wood Street North
Heat Demand (kWh p.a)
10,000,000
1,000,000
100,000
10,000
0
100
200
300
400
500
Metres
PARSONS BRINCKERHOFF
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London, EC2M 4YE
Tel: 020 7337 1700 Fax: 020 7337 1701
DRAWING TITLE
Blackhorse Lane North & South
JOB TITLE
Waltham Forest Heat Mapping
DATE
18/02/2011
SCALE
1:5,000
GEODATABASE
\\GIS\PEL\PEL285432A
PRODUCED BY
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CHECKED
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APPROVED
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DRAWING NUMBER
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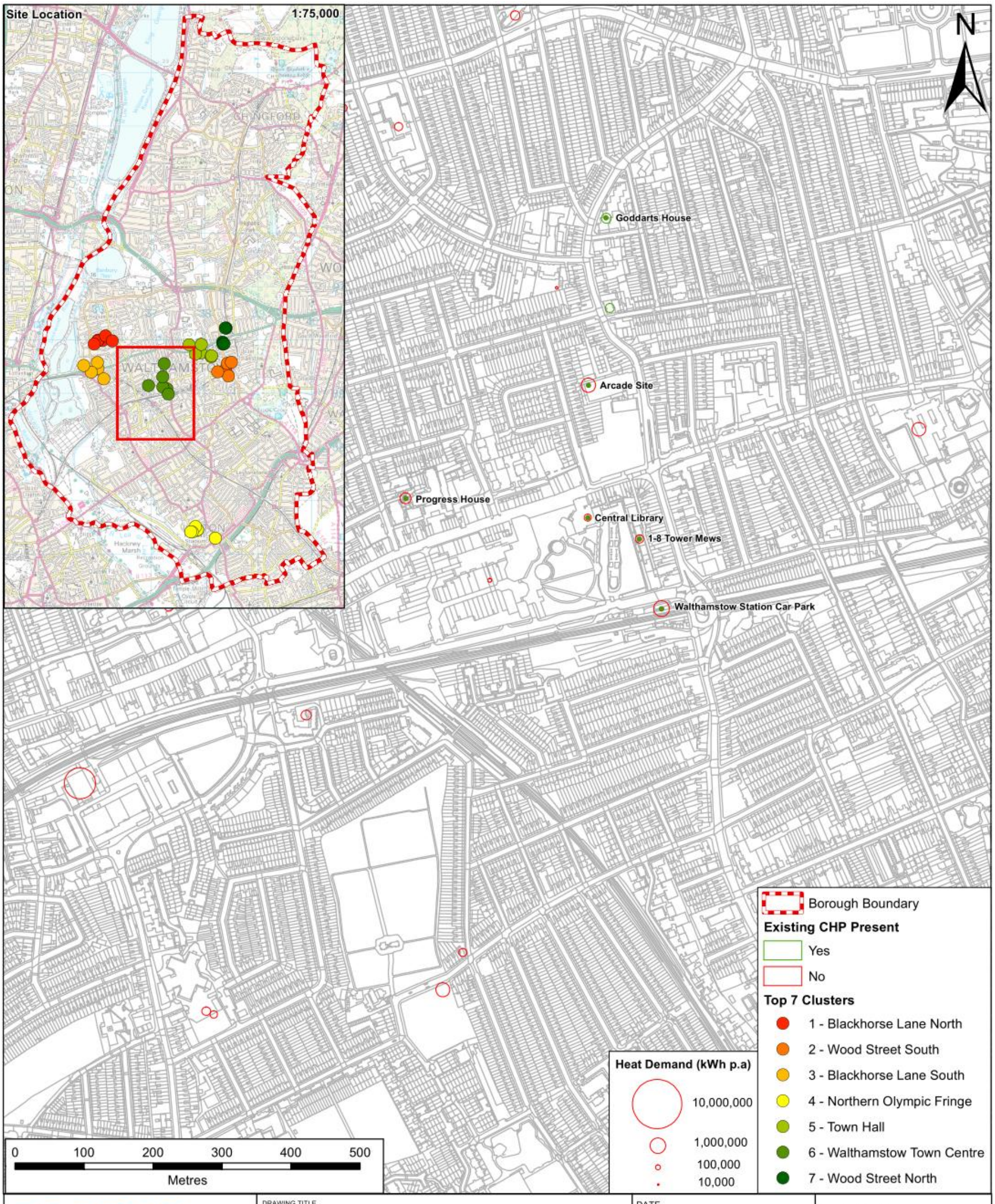
Appendix A10 – Walthamstow Town Centre Cluster Detail


Site Location
1:75,000
N
Goddarts House
Arcade Site
Progress House
Central Library
1-8 Tower Mews
Walthamstow Station Car Park
Borough Boundary
Existing CHP Present
Yes
No
Top 7 Clusters
1 - Blackhorse Lane North
2 - Wood Street South
3 - Blackhorse Lane South
4 - Northern Olympic Fringe
5 - Town Hall
6 - Walthamstow Town Centre
7 - Wood Street North
Heat Demand (kWh p.a)
10,000,000
1,000,000
100,000
10,000
0 100 200 300 400 500
Metres
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DRAWING TITLE
Walthamstow Town Centre
JOB TITLE
Waltham Forest Heat Mapping
DATE
18/02/2011
SCALE
1:5,000
GEODATABASE
\\GIS\PEL\PEL285432A
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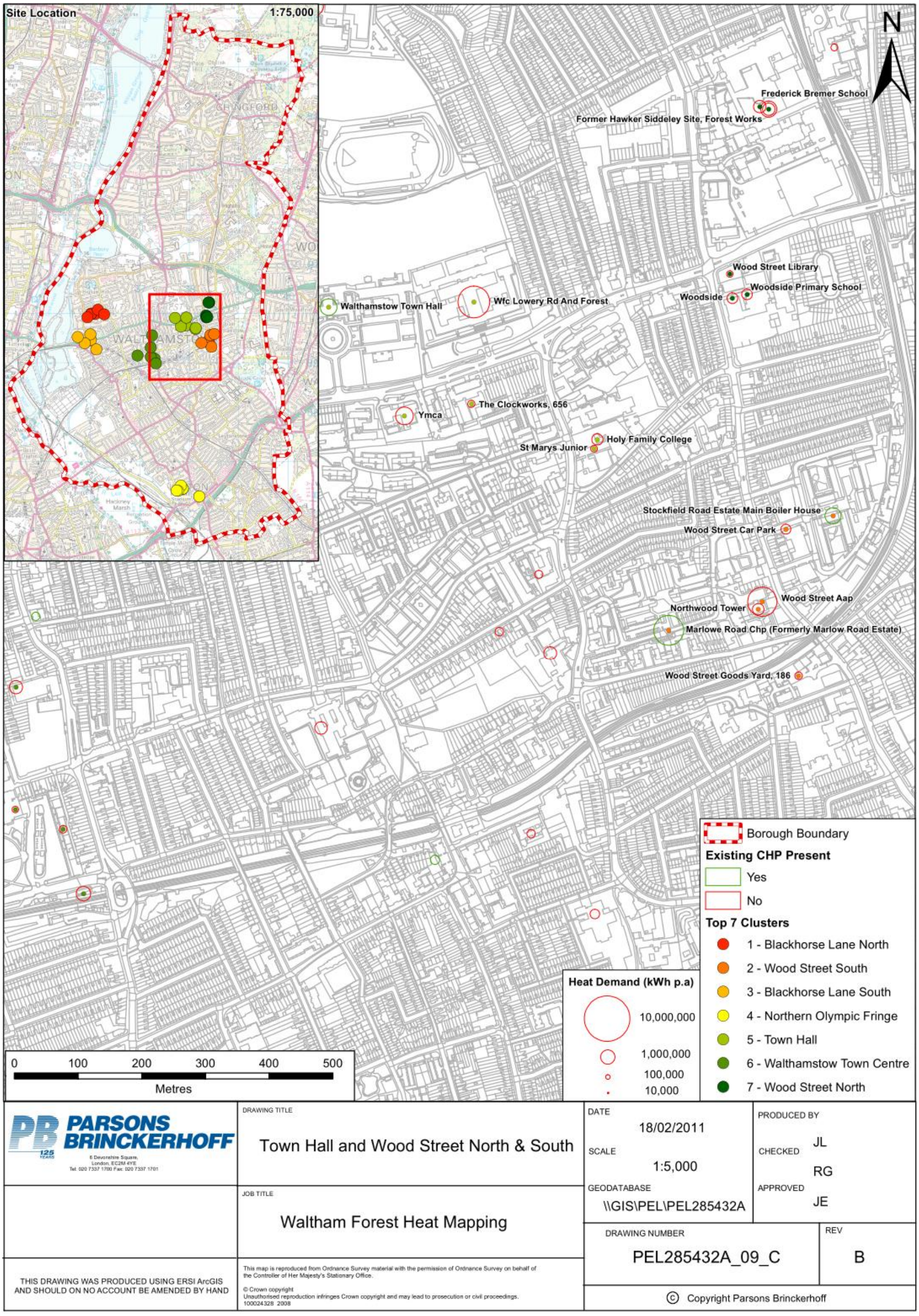
Appendix A11 – Town Hall and Wood Street Clusters Detail


Site Location
1:75,000
N
Frederick Bremer School
Former Hawker Siddeley Site, Forest Works
Wood Street Library
Woodside Primary School
Woodside
Walthamstow Town Hall
Wfc Lowery Rd And Forest
The Clockworks, 656
Ymca
Holy Family College
St Marys Junior
Stockfield Road Estate Main Boiler House
Wood Street Car Park
Wood Street Aap
Northwood Tower
Marlowe Road Chp (Formerly Marlow Road Estate)
Wood Street Goods Yard, 186
Borough Boundary
Existing CHP Present
Yes
No
Top 7 Clusters
1 - Blackhorse Lane North
2 - Wood Street South
3 - Blackhorse Lane South
4 - Northern Olympic Fringe
5 - Town Hall
6 - Walthamstow Town Centre
7 - Wood Street North
Heat Demand (kWh p.a)
10,000,000
1,000,000
100,000
10,000
0 100 200 300 400 500
Metres
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6 Devonshire Square, London, EC2M 4YE
Tel: 020 7337 1700 Fax: 020 7337 1701
DRAWING TITLE
Town Hall and Wood Street North & South
DATE
18/02/2011
SCALE
1:5,000
GEODATABASE
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PRODUCED BY
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JOB TITLE
Waltham Forest Heat Mapping
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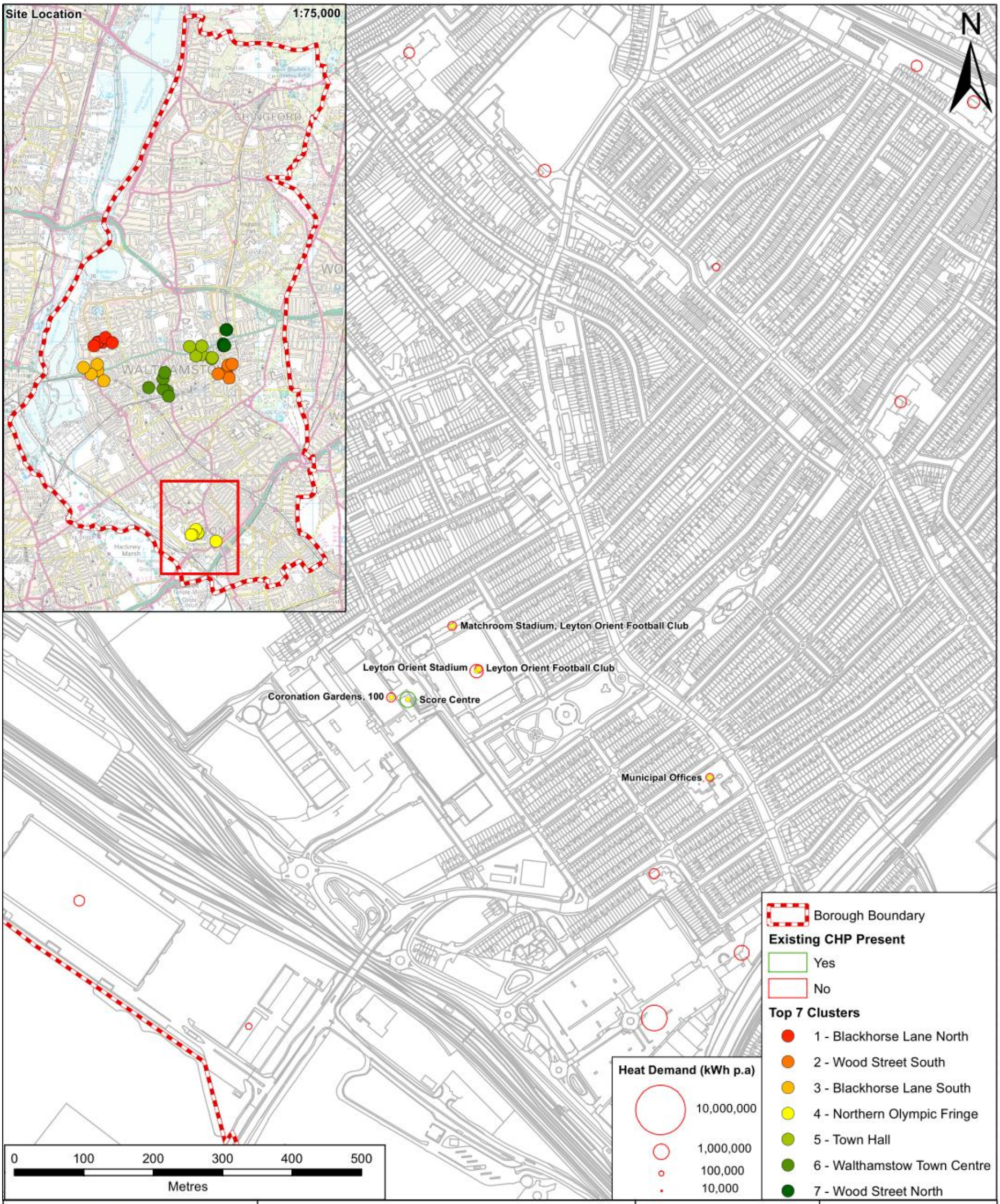
Appendix A12 – Northern Olympic Fringe Cluster Detail



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Tel: 020 7337 1700 Fax: 020 7337 1701

DRAWING TITLE: Northern Olympic Fringe

JOB TITLE: Waltham Forest Heat Mapping

DATE: 18/02/2011
SCALE: 1:5,000
GEODATABASE: \\GIS\PEL\PEL285432A
PRODUCED BY: JL
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APPROVED: JE
DRAWING NUMBER: PEL285432A_09_D
REV: B

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7.2 Appendix B - Assumptions Adopted in Demand Assessment of Future Loads

7.2.1 This table illustrates the assumptions that have been used in the calculation of future demands from new developments.

7.2.2 The following base demand values have been assumed (derived from CIBSE guide TM46:2008 and CIBSE Guide F), with reductions in demand modelled according to date, as outlined below:

Non-Residential		
Use	Benchmark Used (Title)	Heat
		kWh/m².yr
Retail units	Retail	80
Hotel	Hotel - C1	221
Cinema	Cinema	361
Church	Community public building	69
Offices	Offices, mechanically ventilated and/or air conditioned	84
Light Industrial	Light industry	83
Residential		
1-bed flat	E - 1 bedroom flat	80
2-bed flats	F - 2 bedroom flat	82
3-bed flats	G - 3 bedroom flat	76
4-bed flats	*Above extrapolated*	74
4-bed penthouse flat	*Above extrapolated*	74
studio flat	E - 1 bedroom flat	80

A notional split between flat types has been assumed for new residential development

REDUCTION IN BENCHMARKS THROUGH TIME TO REFLECT INCREASING EE STANDARDS
Corresponds only to heat element of regulated energy demand- e.g. there is no direct link to overall targets in terms of emissions reductions.

2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
20%	20%	20%	25%	25%	25%	35%	35%	35%	35%	35%

7.3 Appendix C – London Heat Map Database Entires

7.3.1 This data is submitted under separate cover as an Excel file.