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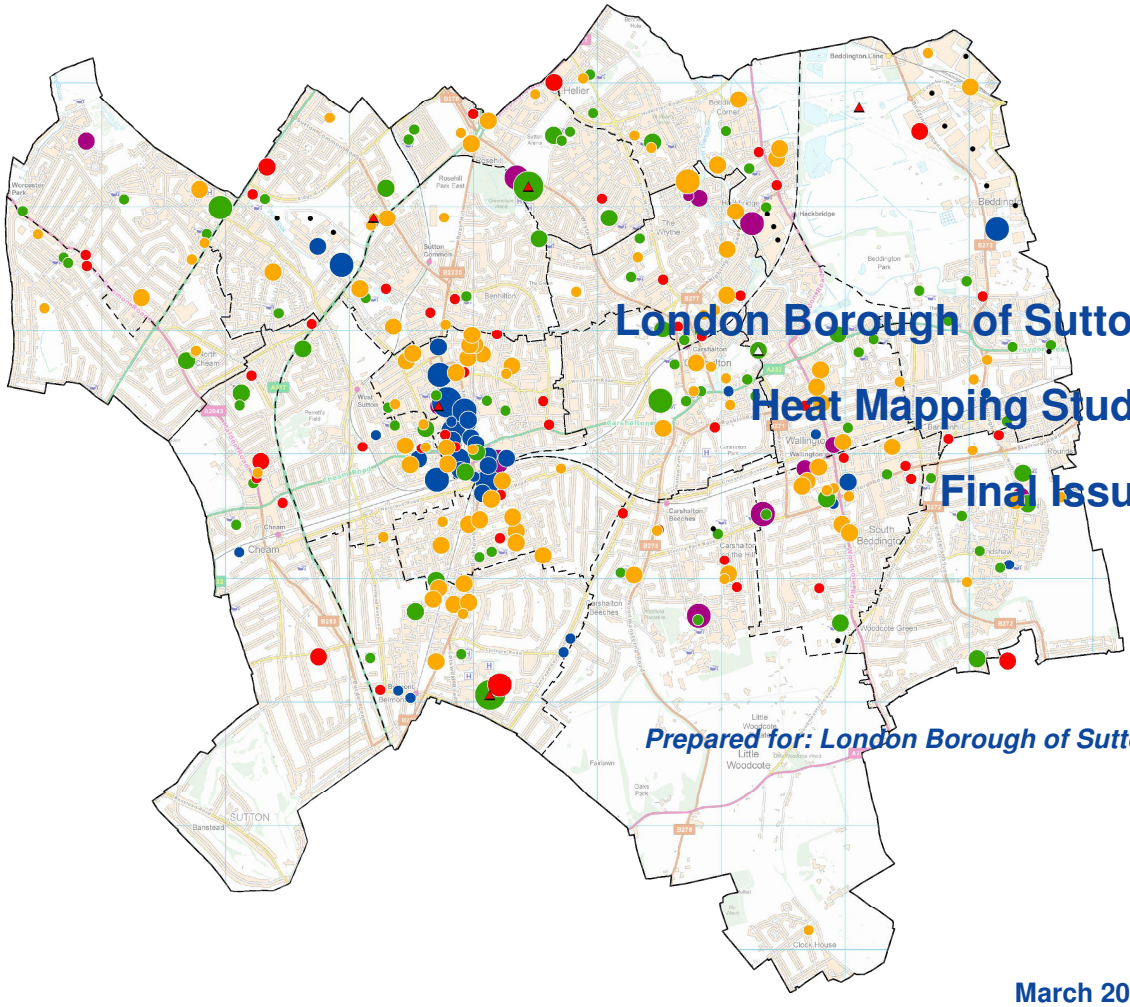

London Borough of Sutton

Heat Mapping Study

Final Issue

Prepared for: London Borough of Sutton

March 2011

Report Title:	Heat Mapping Study
Project No:	49359238
Status:	Final Issue
Client Name:	London Borough of Sutton
Issued By:	URS Corporation Ltd St Georges House 5 St Georges Road Wimbledon London SW19 4DR United Kingdom Tel: + 44 (0) 20 8944 3300 Fax: + 44 (0) 20 8944 3301 www.urscorp.eu

Document Production / Approval Record

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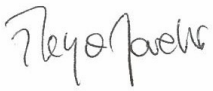
Prepared by	Elena Novello		14/03/2011	Senior Sustainability Engineer
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Document Revision Record

Issue No	Date	Details of Revisions
1	03/02/2011	Draft Issue
2	25/02/2011	Final Issue
3	14/03/2011	Final Issue – comments from the client

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EXECUTIVE SUMMARY

Introduction

In line with national and regional policy, the London Borough of Sutton (LBS) *Core Planning Strategy* emphasises the Council vision for the future development of the Borough:

> *"An environmentally sustainable suburban Borough, building on Sutton's reputation as greener, cleaner Borough and working towards the Council's long-term goal of 'One Planet Living' by addressing the causes and potential impacts of climate change, promoting built energy efficiency and renewables, cutting pollution, reducing waste, managing flood risk and protecting habitats and species diversity."*

By having the goal of sustainable development at the heart of Council planning policy, this vision supports the aims of the UK Sustainable Development Strategy, national and regional planning policy and the London Plan.

This study aims to strengthen the Council's understanding of the potential for low carbon and renewable energy deployment in the Borough and seeks to put forward a spatial strategy for the delivery of such technologies. As a result, this Study will support the Council in its role of promoting the implementation of low carbon, decentralised and renewable energy technologies through its powers that can be applied during the Planning/ Development Control process.

This study intends to delivering a heat mapping study focused around opportunities for and a road map towards the implementation of decentralised energy (DE) in the LBS.

Approach

More than 300 priority buildings were identified when considering the existing building stock and new development proposals in the Borough. Energy consumption data was collected utilising a web-based questionnaire wherever possible and appropriate (please see Chapter 4 for a detailed account of the data collation methodology). 26 priority buildings were identified as large heat consumers, comprising: healthcare and education facilities; multi-address, private commercial and residential buildings.

The energy consumption expected from the forecast development growth in the Borough's key regeneration areas of Sutton Town Centre; Hackbridge Area; Rosehill Area, Wallington; the area between North Cheam and Worcester Park, and Beddington was also considered.

A framework and criteria for analysis was developed to determine the viability of DE in these areas of opportunity, based on the following criteria:

- Technical;
- Strategic;
- Financial;
- Economic; and
- Deliverability and management.

DE Opportunities in Sutton

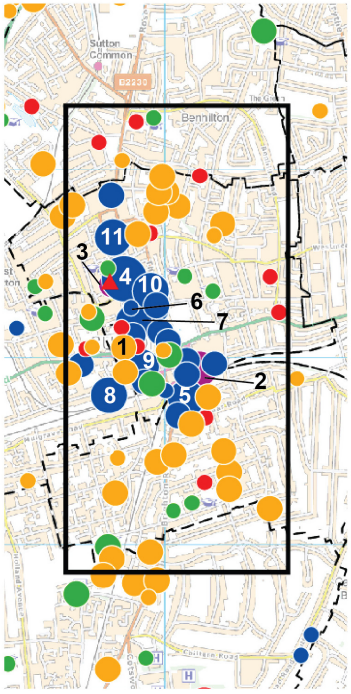
Sutton Town Centre offers a very good technical fit with the DE implementation objectives. The application of the optimised CHP plant capacities (4.8MWe) in Sutton Town Centre could potentially contribute CO_2 emissions savings of approximately 18% (8.2ktCO_2) in this area of opportunity.

In addition to establishing an anchor load consumer base, e.g. the St Nicholas Shopping Centre, this priority building offer an opportunity for energy centre provision.

The major residential development to be located to the south of the Sutton Town Centre offers a mix of uses and demonstrates a diversity of consumer types. It offers wider economic impacts as it allows for infrastructure investment. Delivery and management issues are minimised as this scheme offers commercial viability and reduced financial risks for prospective ESCos.

The housing estates identified might offer delivery opportunities whilst mitigating delivery risks, as the associated heat demand and level of density significantly improves the commercial viability of an ESCo.

The presence of a high number of different priority buildings in different private ownership is likely to result in a higher delivery risk, requiring commitment from a range of stakeholders. The Council should engage with the private stakeholders to determine their interest for connection to a DE network and gain their buy-in.



SUTTON TOWN CENTRE
AREA OF OPPORTUNITY

LEGEND

1	CIVIC COMPLEX
2	AZTEQUE HOUSE
3	ETAP HOTEL, St NICHOLAS CENTRE
4	St NICHOLAS SHOPPING CENTRE
5	QUANDRANT HOUSE
6	TIMES SQUARE SHOPPING CENTRE
7	St NICHOLAS HOUSE
8	HOMEFIELD PARK RESIDENTIAL DEVELOPMENT
9	MORRISONS
10	MARKS AND SPENCER
11	ASDA SUPERSTORE

In ***Hackbridge*** the application of the optimised CHP plant capacity (750kWe) can potentially contribute to CO_2 emissions savings of approximately 8% (1.3ktCO_2) in this area of opportunity.

Generally the Hackbridge area of opportunity and the specific sites identified offer significant delivery opportunities, although delivery risks would have to be managed carefully.

The Felnex industrial area has been identified as a fundamental component for establishing an area wide DE network. It represents an opportunity to provide an energy centre on lower value allocated land. The variety of mixed use developments that are proposed within the Felnex industrial area would offer the required heat demand and density levels, and sufficient diversity to support the feasibility of a DE network in the area. The Council is able to direct and shape development proposals so that whilst the regeneration of the area is private led, the delivery risk of DE is reduced. Currently, for example, the Policy DM6 and further guidance in the Interim Planning Guidance (IPG) recommends that the Council seeks to negotiate Section 106 agreements with developers as appropriate in applying the DE Protocol in accordance with further detailed guidance to be provided in the Council's forthcoming Planning Obligations SPD.

The Felnex industrial area is also surrounded by several other regeneration developments, mainly residential estates (Kelvin House and Durand Close). It is envisaged that the ownership of these developments will be private; therefore the appetite of the stakeholders to connect to a DE network should be gauged by the Council.

BedZED offers a range of opportunities when considering DE implementation: servicing compatibility when considering connection to a district heating network, plant space capacity to support energy centre provision, and storage and supply capabilities when considering biomass.

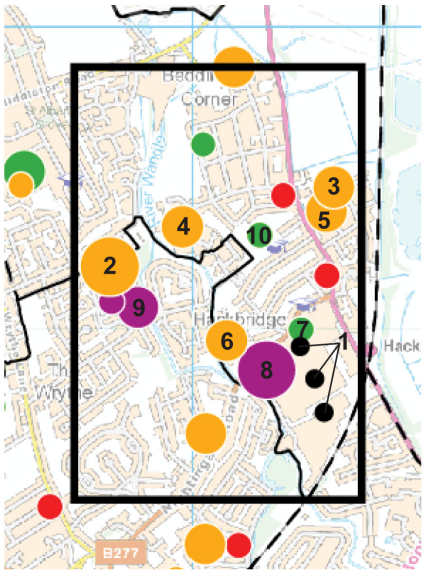
The Beddington Farmlands landfill site situated to the east of the Hackbridge area of opportunity and operated by Viridor, incorporates a Recycling and Composting Centre on 5.02 ha of the site and currently utilises landfill gas to generate electricity for export to the grid. In April 2008, the Council resolved in principle to approve a planning application for Anaerobic Digestion (AD) facilities (Ref: D2005/54794) on part of the site. Although under the terms of the existing temporary planning permission, all waste management activities at Beddington Farmlands are due to cease in 2023 upon the completion of the landfill, the location of this site is considered to be strategic for the deployment of DE networks in the Hackbridge area.

The Council should seek to engage with the relevant Waste Authority/licensed waste contractor to identify future opportunities for securing biogas supply and energy from waste facilities on existing/ allocated waste management sites such as Beddington Farmlands in support of zero carbon CHP energy generation in the Hackbridge area. Waste site allocations will be set out in the adopted South London Waste Plan DPD which is expected in late 2011.

Additionally, the capital costs associated with putting in the pipework within Hackbridge could be significantly less for Hackbridge than for Sutton Town Centre due to the opportunity afforded by the River Wandle to provide the route for the 'low carbon link'.

Generally, Hackbridge has a large number of viable possibilities for the establishment of an energy centre that would support the implementation of a decentralised energy network. However, due to the consensus required by a large range of private stakeholders to consider DE

connection/implementation in the context of delivering regeneration opportunities, the delivery risk may become evident as development progresses. The Council should seek to gain buy-in form these stakeholders as part of the planning application process.



HACKBRIDGE AREA OF OPPORTUNITY

LEGEND

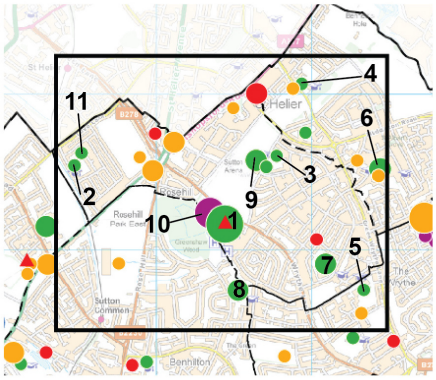
1	THREE EXISTING INDUSTRIAL UNITS, FELNEX INDUSTRIAL AREA
2	DURAND CLOSE RESIDENTIAL REDEVELOPMENT
3	FOXGLOVE WAY RESIDENTIAL DEVELOPMENT
4	MULLARDS CLOSE RESIDENTIAL DEVELOPMENT
5	BEDZED RESIDENTIAL DEVELOPMENT
6	CORBET CLOSE RESIDENTIAL DEVELOPMENT
7	HACKBRIDGE PRIMARY SCHOOL
8	FELNEX TRADING ESTATE & RESTMOOR WAY
9	THE WRYTHE - DURAND CLOSE REGENERATION
10	CULVERS HOUSE PRIMARY SCHOOL

Rosehill appears to offer robust technical characteristics for DE delivery, whilst also mitigating management and delivery risks due to the number of priority buildings that are publicly owned. The application of the optimised CHP plant capacities (1.29MWe) in the Rosehill could potentially contribute CO_2 emissions savings of approximately 14% (2.8ktCO_2) in this area of opportunity.

The Rosehill Area also contains a large number of educational facilities (secondary and primary schools) and a leisure centre, which all surround St Helier Hospital.

St Helier Hospital and the Sutton Arena Leisure Centre acting as anchor heat load consumers, St Helier Hospital anchoring an energy centre, and the educational centres providing a sufficient diversity of consumer types meet the technical criteria for DE implementation and improve the commercial viability of an ESCo operating in this area of opportunity.

A limited range of stakeholders minimises delivery risk as the Council will be able to gain buy-in more readily.



ROSEHILL AREA OF OPPORTUNITY

LEGEND

1	ST HELIER HOSPITAL
2	ABBEY SCHOOL PRIMARY SCHOOL
3	TWEEDALE PRIMARY SCHOOL
4	GREEN WRYTHE PRIMARY SCHOOL
5	MUSCHAMP PRIMARY SCHOOL
6	WANDLE VALLEY SECONDARY SCHOOL
7	CARSHALTON BOYS SPORTS SECONDARY SCHOOLS
8	GREENSHAW HIGH SCHOOL
9	THE SUTTON ARENA LEISURE CENTRE
10	ST HELIER HOSPITAL (new building)
11	GLASTONBURY TRAINING CENTRE

Compared to 2007 figures, gas consumption in ***area between North Cheam and Worcester Park*** is not anticipated to increase, but to remain steady with an area of medium gas consumption due to the predominance of domestic led heat demand in this part of the Borough.

One of the key industrial areas in the Borough (i.e. the Kimpton Industrial Estate) is located to the north of the North Cheam ward. Also, two private commercial buildings are located in close proximity to the industrial estate.

However, according to the combined gas mapping exercise, the gas and electricity consumption of the commercial and industrial estates is limited when compared to other parts of the Borough, i.e. Sutton Town Centre.

Additionally, the heat demand associated with the local government buildings is not large enough to support anchor heat load provision and therefore

the heat demand within this opportunity area would not support the implementation of a DE network.

Additionally, the scattered location of the few priority buildings within this area does not favour effective network distribution.

Therefore the Area between North Cheam and Worcester Park has not been shortlisted for DE implementation in the short to medium term.

Although the spatial and forecast 2026 heat demand analysis in the Area between North Cheam and Worcester Park indicate less favourable conditions for DE delivery, this area would play a crucial part in facilitating cross-borough connectivity with the Royal Borough of Kingston-upon-Thames (RBKC) (refer to Section 6.4).

Pockets of medium gas consumption are also shown in the ***Wallington*** area, generally in agreement with the clusters of priority buildings identified in these zones.

Wallington is residential led with a cluster of medium size residential developments located within a radius of less than 500m.

This district centre is also occupied by local government buildings and schools.

Industrial facilities are not prevalent in this area and only a medium size private commercial centre, i.e. Wallington Square, is present.

The Westcroft Leisure Centre is located to the north of the opportunity area. This building is considered a small/medium heat consumer. An on site CHP plant supplies the heat required to the building.

The growth in gas consumption for the area is limited, and the heat demand characteristics remain steady and stable. This area does not fulfil the technical criteria to support the implementation of a DE network due to a lack of a diverse consumer types and anchor heat load consumers, and low heat demand and density levels.

Therefore Wallington District Centre has not been shortlisted for DE implementation in the short to medium term.

The gas consumption data in the ***Beddington*** regeneration area is lowest than that of any of the other regeneration areas, a fact that may be attributed to the predominance of industrial land uses and the associated lack of heat demand. This is due to the typical servicing strategies for the predominating warehouse units whereby space heating is very rarely provided (large exposed warehouse spaces) and domestic hot water is electrically driven. This servicing strategy is not compatible with connection to a DE network.

There is a limited amount of residential or local government buildings in this area, offering minimal anchor heat load opportunities.

Commercial and retail development is not present in the area other than one large heat consumer located to the north of the area.

Therefore, in view of the proposed DE study, this area has not been shortlisted for DE implementation in the short to medium term.

In addition, subject to adoption of the plan, a proportion of the Beddington Strategic Industrial Area and the Wandle Valley Trading Estate (together with a number of other industrial areas across the partner Boroughs) will also be safeguarded for waste management facilities over the plan period.

All the residual municipal solid waste currently collected among the four partner Boroughs is currently disposed of at the Beddington Farmlands landfill site within Sutton operated by Viridor.

40% of all of the Borough's recyclable waste (i.e. all kitchen and garden waste) is treated at Viridor's In-Vessel Composting Facility at Beddington Farmlands.

Landfill gas is currently utilised to generate electricity for export to the grid. In 2005, Viridor submitted a planning application (Ref: D2005/54794) for an AD facility at the Beddington Farmlands Landfill site which would treat 75,000 tonnes per annum of waste per annum to generate electrical power and heat. A resolution was reached by the Council to grant approval in April 2008 subject to the negotiation of section 106 agreements. In 2010, Viridor submitted a revised planning application for AD (Ref: D2010/62424) which proposed a reduced capacity from 75,000 tonnes per annum (tpa) to 30,000 tpa of source segregated kitchen waste. However, in accordance with the terms of the existing temporary planning permission for waste management activities at Beddington Farmlands, the proposed AD facility would cease in 2023 upon the completion of the landfill. However, as identified previously, the location of this site is considered to be strategic for the deployment of DE networks in the Hackbridge area.

Its location is considered to be strategic for the deployment of DE networks in Sutton, and particularly in Hackbridge. The Council's focus should be on this area supporting 'zero carbon' energy delivery in Hackbridge through biogas production and utilisation within a CHP led district heating network.

Phasing and Intra-Borough Linkages

Based on the evaluation of the shortlisted areas of opportunity, the concentration of demand and density, diversity and anchor loads, and other framework factors, such as delivery and management, financial, etc, it has been demonstrated that Sutton Town Centre (technically led), the Hackbridge area (technically and delivery

led), and Rosehill area (technically and delivery led) offer the highest potential for decentralised energy development/implementation.

In terms of phasing, the deployment of DE in the identified areas of opportunity could originally be established based on single site schemes, with energy centres located in existing plant/boiler rooms or accommodated in the plant room of proposed developments, and where anchor load consumers could guarantee a baseload demand.

Within the Sutton Town Centre area of opportunity, the St Nicholas Shopping Centre could serve as an energy centre location (compatible for connection to a wider district heating network). Safeguarding of plant space for the potential expansion of the energy centre to serve other nearby heat customers would allow for future proofing of expansion capabilities. Latter phases of DE implementation could then consider the neighbouring private commercial buildings, shopping precincts, and residential developments that could act as heat customers.

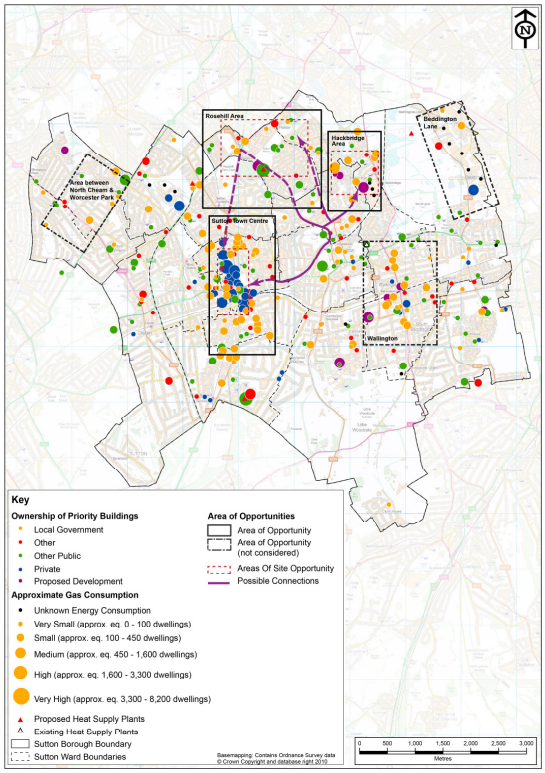
Phasing for the Hackbridge area of opportunity is likely to be driven by planned regeneration. The large landowners in this area offer the best delivery opportunities for energy centre provision due to the subsequent development of large heat customers, which could act as anchor heat load consumers, and sufficient levels of density and mix of uses to support the commercial viability of an ESCo operating in the area. However, it should be noted that these developments would be mainly privately owned, therefore the stakeholders would have to be guided by the Council through the planning application process to deliver the DE vision for the area.

The location of Hackbridge is also strategically important and supports the correct feasibility of an intra-borough wide decentralised energy network. Hackbridge indeed is located close to an existing energy centre (i.e. CHP unit in the Westcroft Leisure Centre) and to a potential EfW facility on the Wandle Estate site and at the Viridor site.

Within the Rosehill area of opportunity, St Helier Hospital offers a first phase delivery option for energy centre provision as part of their development proposals. Latter phases of DE delivery would see St Helier Hospital and the Sutton Arena Leisure Centre acting as anchor heat load consumers. The intent would then be to catalyse the connection to the educational centres.

Initial or first phase DE delivery is typically driven by the identification of suitable energy centre locations that can readily overcome environmental constraints. In the latter phases of DE network development, network expansion and connection would organically evolve to include multi-site mixed use schemes through a number of existing single-site schemes and neighbouring heat consumers to support the commercial viability of an expanded network. The timing for the connection of single-site schemes and heat consumers would be partly driven by the asset replacement cycles of existing building stock. Any major new developments within the areas of opportunity could also be compelled to connect into the network once it is in place or future proofed for connection to support network expansion at a later date. Therefore, alignment of planning policy would be a key consideration at this stage of the heat mapping process.

Over time, a large-scale network could develop that connects the areas of opportunity though the intraconnection of general multi-site schemes and the consolidation of energy production into fewer, larger, more efficient energy centres. Existing and proposed heat supply plants could offer the basis for intraconnection, acting as connection nodes between the areas of site opportunity. Likely network routes should also be established and safeguarded.



Cross-Borough Linkages

Based on the identification of the shortlisted areas of opportunity for DE in the Royal Borough of Kingston upon Thames (RBK)[1] (determined through their heat mapping study), opportunities for DE cross-borough linkages are evaluated.

1 Royal Borough of Kingston upon Thames, *Heat Mapping Study*, *Final Report*, URS June 2010,

Cross-borough linkages can increase the viability of certain DE proposals, for example, by boosting the concentration of head demand and density levels, and offering a greater number of anchor load consumers that are in close proximity to the identified areas of opportunity in the LBS, even if not within the Borough boundary.

The RBK *Heat Mapping Study* identified one major area where potential exists for the deployment of DE, i.e. Kingston Town Centre with support from the activities planned in the Hogsmill Valley area.

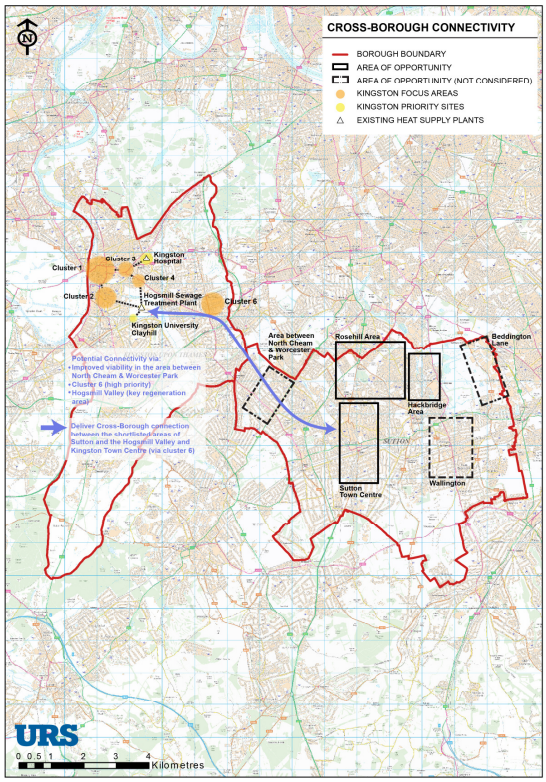
Hogsmill Valley is a key area, which, according to the *Kingston Core Strategy*, the Council is seeking to evaluate and establish as part of a low carbon decentralised energy network. In particular, the Hogsmill Sewage Treatment Works is considered a strategic location for the deployment of DE opportunities in the Borough.

The deployment of a DE network within this area would also take advantage of the Council-owned waste site at Villiers Road that has been identified as a potential area for redevelopment as a waste facility.

Tolworth is also a regeneration area, where the Council will promote social and economic development and environmental enhancement over the next ten years, as indicated in the *Tolworth Project Draft Strategy*[2].

These areas of Kingston are located close to the area of Worcester Park and North Cheam in Sutton.

Although the distance between Hogsmill Valley (and Kingston Town Centre)/Tolworth and Worcester Park/North Cheam is significant, potential linkages could be established between the two areas through connection of proposed and existing developments. However, as the proposed developments in the LBS and RBK consist predominantly of future development areas it is foreseen that there would be limited opportunity to act in the short to medium term. It is likely that these opportunities could develop within the 2026-2050 DE timeframe.



Next Steps

Role of the Council

To reinforce the role of the Council in support of DE delivery, the LBS could consider identifying/creating a 'DE Borough Champion' with responsibility for an intra- and cross-borough strategy for decentralised energy delivery. The 'DE Borough Champion' could be responsible for tasks such as:

- Clearly articulating the contribution to decentralised energy generation and heat networks can make to meeting the Borough's CO_2 emissions savings targets;
- Overcoming barriers to the roll out of decentralised energy and heat networks;
- Supporting necessary changes/adjustments to ensure an effective planning system is in place;
- Engaging relevant stakeholders through workshops and forums;
- Encouraging members of the Local Strategic Partnership, housing associations and other public sector partners (schools, hospitals, leisure centres, etc.) to consider DE options;
- Supporting targeted awareness raising campaigns (i.e. to drive behavioural change) to help build confidence and address organisational barriers; and

[2] *Tolworth Project*, *Draft Strategy*, November 2009

- Working with other responsible bodies to ensure the integrated delivery of community infrastructure.

Stakeholder engagement should be one of the key actions to be undertaken by the 'DE Borough Champion'. This will help gain buy in and bring about behavioural change that will support the deployment of DE networks.

In order to secure investment, the Council will need to use its planning powers to ensure that consumers connect to DE networks. Developers should be required to incorporate CHP, and communal heating and cooling on a site specific basis, and ensure that building services are designed to connect to wider networks in the future (future proofing).

ESCo Procurement

There are a number of different routes to procurement of an ESCo partner and it is generally recommended that selection and involvement of suitable partners takes place as early on in the development process as possible. Procurement routes could include:

- Identification of a private ESCo partner: selection of a specialist CHP provider through a tender process and based on competitive dialogue; and
- Establishment of a new standalone ESCo: the establishment of a special purpose vehicle with a standalone business plan. Options could include:
    - Public/private partnership – local authority partnership with a private sector CHP partner; and
    - Social enterprise – new enterprise established with local authority support (to provide covenant strength) and board representation.

1. INTRODUCTION

1.1. Purpose of this Document

The 2008 Climate Change Act sets a legally binding target to cut UK carbon dioxide (CO_2) emissions by 80% by 2050. Towards achieving this target, the UK Low Carbon Transition Plan and UK Renewable Energy Strategy (DECC, July 2009) set out respective pathways for reducing emissions by 18% on 2008 levels by 2020 and for generating 15% of energy from renewable sources by 2020 in line with the EU Renewable Energy Directive.

One of the Mayor's top priorities for reducing London's CO_2 emissions is to reduce the capital's reliance on centralised power stations. This means increasing the use of local, low carbon energy supplies through decentralised energy (DE) systems. Accordingly, the Mayor's draft 'Climate Change Mitigation and Energy Strategy' (GLA, October 2010) sets out strategic targets to achieve a 60% reduction in London's carbon dioxide emissions by 2025 against a 1990 baseline and to ensure that 25% of London's energy is delivered through local DE systems by 2025. In support of these targets, the Consultation Draft Replacement London Plan (GLA, October 2009) requires London Boroughs to embed policies and proposals within their Local Development Frameworks (LDFs) in support of establishing DE network opportunities.

To meet this challenge, the London Development Agency (LDA) is working with the London Boroughs to provide energy masterplanning to identify where and how DE can be installed and promoted.

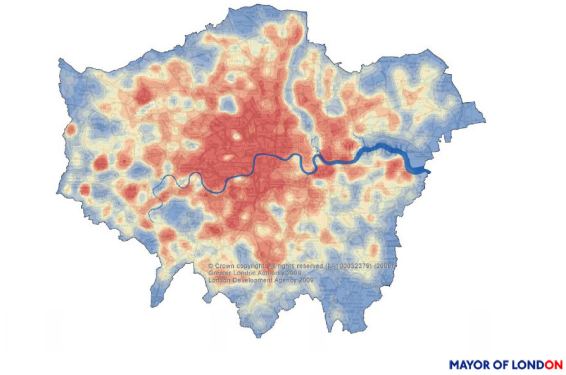
There are a number of key considerations that contribute to an evidence based understanding of local feasibility and potential for DE in the London Borough of Sutton (LBS). It is particularly important to understand the heat and power demands of existing buildings, and new and future development, and existing (and possibly under used) DE/heat generation sources, as there may be opportunities to link existing and new/future development together.

The London Development Agency (LDA) has produced a suite of 'service packages' setting out the steps necessary to support the London Boroughs to deliver a DE project, from concept through to implementation. One of the 'service packages' provided by the LDA is Heat Mapping, which involves the detailed mapping of decentralised energy data for the London Boroughs.

Heat mapping information from the London Boroughs is subsequently incorporated into the London Heat Map (*Figure 1–1*), an interactive platform displaying high level data on DE across London. The London Heat Map (LHM) has been recently developed to help address the lack of information and certainty surrounding London's heat loads. It is intended to be used by the London Boroughs, landowners and developers to help identify opportunities for DE in their area and to support the development of new decentralised energy schemes. It also enables the market to make informed investment decisions without risking significant development costs.

The LBS is undertaking Phase 1 of the development of a Heat Map. This Study has been carried out as part of Phase 1 in order to collect data relevant to the energy consumption of high energy users and energy demand characteristics within the Borough to support the creation of a robust Heat Map.

Figure 1-1: The London Heat Map



1.2. Structure of this Document

The remainder of the report covers the items outlined in our proposal and are structured as follows:

- Chapter 2 is a review of key national, regional and local policies;
- Chapter 3 presents a general overview of DE networks;
- Chapter 4 presents our methodology on the Heat Map data collection process;
- Chapter 5 presents the analysis of the Heat Map;
- Chapter 6 discusses the key opportunities for DE in the LBS;
- Chapter 7 identifies the next steps towards the implementation of a DE network in the LBS; and
- Chapter 8 summarises the results of the work into a high level implementation plan for the LBS.

2. POLICY CONTEXT

2.1. UK Climate Change Agenda

The UK Government has responded to the climate change agenda with a wide range of climate change legislation, targets and actions for Green House Gas (GHG) emissions cuts. Relevant initiatives include:

- Setting a national target of 80% cuts in annual GHG emissions compared to 1990 levels by 2050, with an interim target of 34% cuts by 2020;
- Establishing the world's first national Climate Change Act to tackle the threat of climate change;
- Incentive programmes, such as the: Renewables Obligation (RO); Feed-in Tariffs (FITs); Renewable Heat Incentive (RHI); the Green Deal and the Carbon Reduction Commitment (CRC);
- A mandatory requirement for new homes to achieve at least a 25% reduction in regulated CO_2 emissions compared to 2010 Building Regulations in line with the minimum level of carbon performance required to achieve Code for Sustainable Homes (CSH) Level 4 by 2013 and 'zero carbon' standards by 2016 in line with Code Level 6.
- A likely requirement for new non-domestic development to achieve 'zero carbon' status by 2019.

Legislation is intended to support the transition to a low carbon economy – an economy that minimises environmental impact, is sustainable and limits GHG emissions.

2.2. London's Climate Change Agenda

The Mayor of London recognises the imperative to address climate change and has set an ambitious target to achieve 60% savings in London's CO_2 emissions against 1990 levels by 2025.

In particular, the Mayor supports the need to generate more of London's energy from decentralised energy sources. The Mayor's draft 'Climate Change Mitigation and Energy Strategy' (GLA, October 2010) specifically sets a target of supplying 25% of London's energy needs through DE sources by 2025 and 50% by 2050.

Cutting the Capital's Carbon Footprint: Delivering Decentralised Energy[3] sets out recommended measures needed to achieve the above targets. Overseen by a group of the capital's business leaders, it makes several key recommendations, including the need for further economic incentives, projects of a sufficient scale, approaches involving the public and private sectors, the delivery of energy masterplans and the creation of a public sector centre of expertise capable of working at both strategic and project levels.

Powering Ahead, Delivering Low Carbon Energy for London[4] describes how delivering decentralised energy on a large scale faces commercial challenges requiring high levels of upfront capital expenditure. The report indicates that the investment environment is changing as political initiatives are beginning to create a more favourable policy framework for decentralised energy. Ensuring a positive regulatory and policy context is critical to delivering decentralised energy, as is the public sector's ability to remove delivery barriers. National policy changes, such as the introduction of Feed-in Tariffs (FITs) and the extension of the Climate Change Levy (CCL) exemption for indirect sales of CHP electricity to 2023, will have a positive impact on the delivery of DE networks in London.

The document recognises the crucial role that London's Boroughs are playing as facilitators – providing supportive local policies and assembling public heat demand data as part of the London Heat Map. The document includes a pipeline of potential projects and outlines the partners and interventions required to deliver them in order to illustrate the scale, commercial structures and role of the public sector in unlocking opportunities.

2.3. Planning Policy

Overall, planning policy at the national, regional and local level places increasing emphasis on the importance of integrating low and zero carbon energy generation in new development to obtain planning permission and help achieve national, regional and local targets for carbon emissions savings.

National Planning Policy

At the national level, relevant planning policy includes *PPS1 Delivering Sustainable Communities*, *Supplement to PPS1 Planning and Climate Change*, *PPS22 Renewable Energy* and the *Companion Guide to PPS22*. These encourage a contribution to achieving CO_2 emissions savings, stabilising climate

[3] London First, October 2008

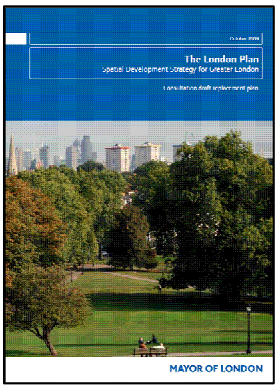
[4] LDA, 2009

change (mitigation) and taking into account the unavoidable consequences (adaptation).

The Supplement to PPS1 on 'Planning and Climate Change' (2007) highlights the need to secure progress against the UK's long-term emission targets, deliver zero carbon developments, shape sustainable communities resilient to climate change and promote innovation and investment in renewable technologies. Planning policies should seek to ensure that a significant proportion of the energy supply for developments is generated on-site and renewably and/or from decentralised, renewable or low-carbon sources. Local planning authorities are encouraged to focus on area or site-specific opportunities in setting local targets for reducing carbon dioxide emissions, based on an understanding of the local potential for renewable or low-carbon energy and existing or planned decentralised energy infrastructure to serve new development.

PPS22 promotes the appropriate development of renewable energy schemes throughout the UK. This includes schemes in urban as well as rural locations, ranging in size from domestic to commercial scale. The documents highlight that if CO_2 emissions savings targets are to be met, a positive and innovative approach will be required.

Regional Planning Policy



In October 2009 the Mayor of London published the *Consultation Draft Replacement London Plan*. The formal publication of the *Replacement London Plan* is expected towards the end of 2011. The *London Plan*, published in February 2008, will be in force and will have legal status until the *Replacement London Plan* is formally published. However, policies in the *Consultation Draft Replacement London Plan* will be a material consideration when deciding planning applications, and will gather weight as the replacement process progresses.

The *Consultation Draft Replacement London Plan* sets out a comprehensive range of policies to underpin London's response to climate change. Whilst the overall thrust and direction of the document on tackling climate change is the same as the current *London Plan*, some changes to the existing policies are proposed. With regard to development proposals, the Mayor acknowledges that the early design stage is the most cost effective time to incorporate relevant design and technological measures, enabling development proposals to realise their full potential to minimise carbon dioxide emissions and adapt to climate change.

Development proposals are still required to minimise their carbon dioxide emissions in accordance with the Mayor's energy hierarchy (i.e. be lean: use less energy; be clean: supply energy efficiently; and be green: use renewable energy), and submit a detailed energy assessment to demonstrate how the minimum targets for carbon dioxide emissions savings are to be met within the framework of the energy hierarchy outlined above (Policy 5.2 – Minimising carbon dioxide emissions).

Policy 5.2 also introduces new targets on carbon dioxide emissions savings applicable to all major development proposals. The carbon dioxide emissions savings targets should be met through on site energy efficiency and passive design measures, and low and zero carbon technologies. Where it is clearly demonstrated that the specific targets cannot be fully achieved on site, any shortfall may be provided off site or through a cash-in-lieu contribution to the relevant Borough to be ring fenced to secure delivery of carbon dioxide emissions savings elsewhere.

As with the current *London Plan*, development proposals are required to demonstrate how sustainable design standards have been integrated in the design process (Policy 5.3 – Sustainable design and construction). Major development proposals are required to meet the minimum standards outlined in the Mayor's supplementary planning guidance on sustainable design and construction[5].

The *Consultation Draft Replacement London Plan* requires Boroughs to develop policies and proposals to identify and establish DE network opportunities, as part of their Local Development Frameworks (LDFs) in order to meet the Mayor's target for London to generate 25% of its heat and power requirements through the use of local, DE systems by 2025. (Policy 5.5 – Decentralised energy networks). The London Heat Map tool has been developed to assist Boroughs, landowners and developers to identify DE opportunities across London.

Development proposals are required to evaluate the feasibility of Combined Heat and Power (CHP) systems and the opportunity to extend the system beyond the site boundary to adjacent sites (Policy 5.6 – Decentralised energy). Major development proposals should select energy systems in accordance with the following hierarchy:

[5] GLA, *Sustainable Design and Construction*, *The London Plan Supplementary Planning Guidance*, 2006

i. Connection to existing heating or cooling networks;

ii. Site wide CHP network; and

iii. Communal heating and cooling.

Where future DE network opportunities are identified, proposals should be designed to enable connection to these networks, i.e. future proofed.

Local Planning Policy

The Development Plan for the Borough comprises the *London Plan*, the adopted *Core Planning Strategy*[6] and the remaining 'saved' policies of the LBS' *Unitary Development Plan* (*UDP*), which are set out in the Appendices of the *Site Development Policies*[7] document.

Sutton's *Core Planning Strategy* sets out the Council's spatial strategy for the future development of the Borough over the next 10-15 years and identifies the physical, social and green infrastructure that will be required to serve this development in different parts of the Borough.

Strategic Objective SO5 of the *Core Planning Strategy* seeks to make the fullest contribution to the mitigation of and adaptation to climate change within the Borough, minimising carbon dioxide emissions from new development by promoting energy efficiency, the efficient supply of energy, and renewable sources of energy.

Strategic Objective SO8 supports waste minimisation, recycling and composting, and recovering the maximum value from residual waste through the sufficient provision of waste management facilities within the Borough as part of the ambitions of the South London Waste Plan (SLWP) to achieve self-sufficiency by 2020.

Core Policy PMP1 on 'Housing Provision' makes provision for the Borough's share of London's housing needs and for local needs in excess of 3,450 net additional dwellings by 2016-17 in accordance with the *London Plan* and any subsequent target approved by the Mayor over the period of the *Core Planning Strategy*. The provision of new dwellings will be broadly located within the Borough as follows: Sutton Town Centre – 40%; Hackbridge – 20%; and the remainder of the Borough – 40%.

Core Policy PMP4 on 'Main Locations for Industry' 'confirms that an adequate supply of industrial land and provision of employment opportunities in the Borough will be maintained over the period of the *Core Planning Strategy*. In particular, the Council will:

- Encourage the development and intensification of Kimpton and Beddington as Strategic Industrial Locations; and
- Retain and promote the intensification of employment uses as part of proposals for mixed use development on the following Established Industrial Locations: the Wandle Valley Trading Estate, Hackbridge Station and Felnex Trading Estate.

Core Policy BP6 on 'One Planet Living' seeks to address the causes and impacts of climate change by setting targets for carbon dioxide emissions savings in accordance with the *London Plan* and in order to promote Sutton as a Borough by:

- Minimising carbon dioxide emissions from all new development by using less energy be lean), supplying energy efficiently (be clean) and using renewable sources of energy generated on site (be green);
- Safeguarding existing heating and cooling networks and maximising opportunities for implementing new district-wide networks supplied by decentralised energy (including renewable energy generation) in partnership with key stakeholders;
- Maximising opportunities for implementing new district-wide networks utilising decentralised energy sources such as Combined Heat and Power (CHP) technology;
- Promoting the highest standards of sustainable design and construction, and achieving high levels of performance against the Code for Sustainable Homes and BREEAM; and
- Delivering the sustainable regeneration and growth of the Hackbridge neighbourhood and Sutton Town Centre in line with 'One Planet Living' principles and as 'Low Carbon Zones' under Core Policies PMP6 and PMP7, with 'zero carbon' standards to be achieved for all new developments within the Hackbridge neighbourhood from 2011.

According to Core Policy BP8, the Council supports the objectives of sustainable waste management set out in *PPS10* and the *London Plan*. The Council is currently identifying the necessary capacity in collaboration with the neighbouring South London Boroughs of Croydon, Merton and Kingston to maximise self-sufficiency in managing waste generated. To achieve this, the Council is working with its partners across South London to prepare a *Joint Waste DPD*, anticipated for adoption at the end of January 2011, as confirmed in the *South London Waste Plan Proposed Submission*, January

[6] LBS, *DPD Core Planning Strategy*, December 2009

[7] LBS, *Site Development Policies DPD Submission document*, 2011

Sutton's Site Development Policies DPD, which was approved for submission to the Secretary of State in February 2011, sets out a range of development management policies and site allocations which provide the means for implementing the Council's spatial strategy for the future development of the Borough established in the *Core Planning Strategy DPD.*.

Specifically, Policy DM5 on 'Sustainable Design and Construction requires all new residential developments to achieve Code for Sustainable Homes Level 4 from 2011.

Policy DM6 on 'Climate Change Mitigation' (part a) sets out Borough-wide targets for reducing carbon dioxide emissions expressed as a percentage improvements over the Target Emission Rate[8] (TER) set out in the 2010 Building Regulations. All new residential buildings should achieve a 25% reduction from 2011-13 (in line with Code for Sustainable Homes Level 4), a 40% reduction from 2013-16 (or London Plan targets as amended); and 'zero carbon' standards[9] from 2016. All major non-residential buildings should achieve a 25% reduction from 2011-13; a 40% reduction from 2013-16; a percentage reduction in line with future Building Regulations from 2016-19; and 'zero carbon' standards from 2019.

Policy DM6 (part B) confirms that proposed developments within Hackbridge should achieve net 'zero carbon' standards fro 2011 in line with the Core Planning Strategy and minimum Fabric Energy Efficiency standards for new dwellings set under Code for Sustainable Homes Levels 5 and 6.

Policy DM6 (part C) states that proposed developments should apply the Mayor's energy hierarchy by:

(i) achieving the highest standards of energy efficient design and layout;
(ii) being designed to connect to and, where appropriate, contribute towards existing or future decentralised energy (DE) networks, supplied by low or zero-carbon energy, particularly within the Hackbridge sustainable neighbourhood and other identified DE Opportunity Areas, by applying the Council's DE Protocol; and
(iii) using renewable sources of energy generated on-site.

Policy DM6 (part D) states that where compelling reasons can be demonstrated that achieving the relevant carbon dioxide reduction targets on or near site would not be technically feasible or economically viable, the Council will negotiate Section 106 agreements with developers to fund the delivery of carbon reduction measures off-site through the 'carbon offset fund' in accordance with further guidance to be provided in the Council's Climate Change SPD.

Policy DM6 (part E) states that all planning applications for new dwellings or major non-residential developments should be accompanied by an Energy Assessment to demonstrate how the relevant targets for reducing carbon dioxide emissions and promoting renewable energy technologies will be met.

In seeking to apply the second step of the Mayor's energy hierarchy in line with Policy DM6 (part C), the supporting text to Policy DM6 incorporates the following 'DE Protocol' in order to ensure that proposed developments are designed to connect to and, where appropriate, contribute towards the delivery of DE infrastructure supplied by renewable or low carbon energy technologies:

(i) *Where the proposed development is adjacent to an existing DE network, it should:*
- *secure the direct connection of all units to that network; and*
- *contribute as necessary to the increased capacity of the DE network to support such connection.*

(ii) *Where there is an existing DE network that requires extension in order to supply the proposed development, proposed developments should:*
- *contribute to such extension;*
- *secure the direct connection of all units to the extended network; and*
- *contribute as necessary to the increased capacity of the DE network to support such connection.*

(iii) *Where there is a planned DE network within feasible and viable range of future connection and/or within identified DE Opportunity Areas, proposed developments should:*
- *commit to connect to any future DE network provided that (i) the reliability of the system has been demonstrated continuously over a period of 6 months, and (ii) the costs in sourcing heating and hot water by the residential and non-residential units will not materially increase;*
- *incorporate site-wide and/or communal heating systems, and not include in-unit boilers or electrical heating systems, where a future connection to the planned DE network is viable;*
- *ensure that the proposed site-wide and/or communal heating systems are equipped to connect any future DE network with minimum need for retrofit;*
- *provide sufficient space within the energy centre or plant room to*

[8] based on the Standard Assessment Procedure (SAP) 2005 as amended

[9] as defined in the Code for Sustainable Homes as amended

accommodate additional future heat generation capacity to supply DE connection equipment such as pipes, heat exchangers and pumps etc

- *locate the energy centre or plant room to ensure the shortest connection distance to the future network, having regard to the requirements of the network as a whole;*
- *use the layout, density and mix of development to support identified DE opportunities;*
- *provide pipe connections as appropriate to the site boundary or safeguard an identified route within the site for future DE connection infrastructure; and*
- *where the planned DE network requires extension to supply the proposed development, proposed developments should contribute to such extension.*

(iv) *Where there is no existing or planned DE network within feasible or viable range of future connection, proposed developments should incorporate site-wide and/or communal heating and cooling systems to serve the development where feasible and viable, and not include in-unit boilers or electrical heating systems. Such heating and cooling systems must be designed to run efficiently and be optimally sized to maximise carbon dioxide savings.*

It is already proposed in the Core Planning Strategy (Pt d, Core Policy DM6), that the Council will work with developers and a range of partners, including Multi-Utility Services Companies (MUSCOs) or similar bodies as appropriate, to deliver and manage renewable and DE infrastructure to serve new and existing development within Hackbridge, Sutton Town Centre and other suitable locations. It is further required that all new development must be designed to connect to any existing or planned local or district CHP networks

In particular, the existing local centre of Hackbridge has been identified as a 'Centre for Growth and Regeneration'[10] involving a comprehensive redevelopment of the wider Hackbridge area to provide a district centre and a sustainable mix of homes, businesses, shops, and community and leisure facilities. Within the Hackbridge area, the established industrial areas such as the Felnex and the Wandle Trading Estates, and land north of Hackbridge Station provide opportunities for mixed use development (housing led). It is intended that the area comprising the Felnex and Kelvin House sites represent the most significant regeneration opportunity within Hackbridge[11]

Accordingly the supporting text to Policy DM6 notes that in order to deliver zero carbon standards as part of the redevelopment of the key sites initially identified in the draft Hackbridge Masterplan and subsequently taken forward in the Site Development Policies DPD, the Council has prepared a Multi-Utility Sustainable Infrastructure Strategy[12]. or 'MUSIS' for Hackbridge (Inventa Partners, November 2009) which identifies a preferred approach for the delivery of a district-wide DE network to serve new and existing development within the area. The Council is currently seeking to procure an energy services company (ESCo) to deliver and manage the MUSIS to new and existing development on a partnership basis.

This work concluded that a key part of achieving the goal of 'zero carbon' is through the provision of district energy. This locally produced energy will be distributed as hot water to provide space heating and domestic hot water, and as electricity sold to the national grid. Such locally produced energy requires significant capital expenditure and the purpose of the *MUSIS* was to identify how this cost might be met, in full or in part, by the private sector.

In December 2009, a second stage of the MUSIS was carried out involving a "soft" market testing exercise.

Both stages of the *MUSIS* concluded with the preparation of the *Hackbridge Integrated Infrastructure Implementation Plan* (*HIIIP*)[13], which is to be used as a reference point for the assessment of planning applications within the Hackbridge Project area in terms of energy and transport.

The current version of the *HIIP* summarises the progress made to date to deliver an integrated approach to infrastructure development within Hackbridge. This document goes over the main outputs generated by the previous studies conducted. Specifically, it was concluded that:

a. There is significant energy market interest in the Hackbridge Project area;

b. Considering the return on investment, it should be possible to secure in excess of 50% of the total costs for the development;

c. The level and nature of the market interest suggests that it should be possible to incentivise developers to be part of the DE network rather than 'go-it-alone';

[10] LBS, *DPD Core Planning Strategy*, December 2009

[11] *Hackbridge Masterplan*, Section 8, Development Brief: Felnex and Kelvin House

[12] Inventa, *MUSIS*, November 2009

[13] LBS, *Hackbridge Integrated Infrastructure Implementation Plan* (*HIIIP*), March 2010

d. The opportunity to utilise the biogas produced by the Viridor plant has genuine value and this could be exploited relatively simply and cost effectively; and

e. A formal procurement process would obtain similarly strong interest from energy services companies (ESCos).

The Council is currently seeking to procure an energy partner to deliver and manage a low or zero carbon DE network serving Hackbridge under a Procurement Board established by the Developers Forum. It is intended that this process will be developed simultaneously with the appraisal of the Felnex and Kelvin House applications.

The South London Waste Plan DPD, which the Council is preparing jointly with Croydon, Merton and Kingston will identify locations suitable for waste management facilities to meet the *London Plan* apportionment of approximately 1.3 million tonnes in 2020. The Waste Plan will also include a range of policies aimed at reducing the adverse environmental impacts of waste facilities and minimising waste to landfill, while ensuring that positive benefits are realised, in particular the production of heat and power for local use.

Policy WP8 of the *South London Waste Plan Proposed Submission*, document (December 2010) on 'Sustainable Energy Recovery' states that proposed waste to energy developments will be required to:

- demonstrate that the waste identified for treatment cannot practically be reused or recycled in accordance with Policy WP1;
- demonstrate that the proposal will achieve a positive carbon outcome and contribute to local targets for reducing carbon emissions;
- deliver renewable heat and power (or heat, power and cooling), for local users where feasible; and,
- minimise potential adverse impacts on human health, local amenity and environment in accordance with Policies WP6 and WP7.

Policy WP8 goes on to state that any proposed thermal treatment facilities must allow for the recovery of renewable heat and power (or heat, power and cooling) and be within a fully enclosed covered building. Preference will be given to advanced conversion technologies such as anaerobic digestion, gasification and pyrolysis.

The following sites within Sutton are identified as suitable for waste management facilities:

- Country Waste Recycling Ltd, Beddington Lane (Site 17);
- Viridor Recycling and Composting Centre, Beddington Lane (Site 18);
- 777 Recycling Centre, Coomber Way (Site 21);
- Bardon Aggregates, Coomber Way (Site 87)
- Severnside Waste Paper, Beddington Lane (Site 97);
- Croydon Transfer Station, Endeavour Way (Site 98);
- European Metal Recycling, Therapia Lane (Site 100).

In addition, subject to adoption of the plan, a proportion of the Beddington Strategic Industrial Area and the Wandle Valley Trading Estate (together with a number of other industrial areas across the partner Boroughs) will also be safeguarded for waste management facilities over the plan period.

All the residual municipal solid waste currently collected among the four partner Boroughs is currently disposed of at the Beddington Farmlands landfill site within Sutton operated by Viridor.

40% of all of the Borough's recyclable waste (i.e. all kitchen and garden waste) is treated at Viridor's In-Vessel Composting Facility at Beddington Farmlands.

Landfill gas is currently utilised to generate electricity In 2005, Viridor submitted a planning application (Ref: D2005/54794) for an AD facility at the Beddington Farmlands Landfill site which would treat 75,000 tonnes per annum of waste per annum. It is proposed that the biogas produced by the anaerobic digestion of the organic waste can be used by a CHP engine to generate electrical power and heat. A resolution was reached by the Council to grant approval in April 2008 subject to the negotiation of section 106 agreements. In 2010, Viridor submitted a revised planning application for AD at Beddington Farmlands (Ref: D2010/62424) which proposed a reduced capacity from 75,000 tonnes per annum (tpa) to 30,000 tpa of source segregated kitchen waste. However, in accordance with the terms of the existing temporary planning permission for waste management activities at Beddington Farmlands, the proposed AD facility would cease in 2023 upon the completion of the landfill. However, as identified previously, the location of this site is considered to be strategic for the deployment of DE networks in the Hackbridge area.

3. DECENTRALISED ENERGY NETWORKS

3.1. District Heating as Decentralised Energy

The UK's centralised energy network is characterised by significant generation of waste heat at power stations in locations remote from concentrations of demand. Transmission losses are also associated with electrical power distribution. A DE system that produces energy in the form of heat and electrical power at or near the point of use provides the opportunity to improve utilisation of energy and reduce the carbon intensity of the energy network. This results in an improvement of the efficiency of energy supply. In summary, decentralised energy brings a range of benefits including:

- Ability to capture the waste heat from energy generation and use it nearby (CHP);
- Reduce the energy lost in transmission networks;
- Increased use of renewable and low carbon sources of fuel;
- Increased flexibility for energy generation to match local demand patterns for electricity and heat;
- Greater energy security for businesses and households that control their own energy generation; and
- Reduce the costs to the developer in achieving area-specific targets for carbon reduction set through LDF policies;
- Potential to supply low or zero carbon energy to existing housing and buildings within the area
- Greater awareness of energy issues through community based energy systems, driving behavioural change and the more efficient use of energy resources.

The local benefits of implementing a decentralised energy network (DEN) in a region can be summarised as follows:

- Regional organisations, businesses and individuals would benefit from improved energy security and reduced costs, which would improve the competitiveness of the region;
- It will support the region in achieving a low carbon economy;
- Offers significant investment in the region and increases employment opportunities;
- The experience gained could become a skills export opportunity; and
- It provides opportunities to build on regional expertise and skills in renewable and low carbon fuel sources such as biomass, biogas and syngas.

The most common form of decentralised energy supply considered in the UK is community or district heating in which heat is delivered to multiple buildings from a local plant via a network of insulated pipes buried in the ground. The pipe network can be installed at the same time as other utility services (e.g. water, drainage, telecoms, etc.) to minimise costs to new development. It is also possible to retrofit existing buildings and there are convincing cost/benefit arguments for supplying heat to existing rather than new buildings[14].

District heating networks served by CHP plant are considered to have the largest potential for carbon dioxide emission savings. CHP with district heating is a local, decentralised community energy system that captures and utilises waste heat from power generation to maximise energy utilisation efficiencies. This waste heat can be readily distributed to buildings via a pipework network. The electrical power produced could be exported to the national grid or provided to other users over a local electricity distribution network or over a new, community owned or part owned network (known as a private wire network).

CHP with district heating has the added benefit of future proofing a district's energy supply because it allows a range of fuel sources to be considered, such as biomass, biogas (from AD processes) or syngas (from gasification processes), at a later stage when technologies and fuel supply chains are more mature. Furthermore, CHP has a minimal visual impact on the townscape, although the siting of urban CHP energy centres requires careful consideration (see Section 6.1) and are therefore best planned at the neighbourhood masterplanning stage.

A DEN and associated energy centre can typically support a 3km pipework distribution radius; however, utilising a number of satellite top-up boiler systems/energy centres connected to the DEN at strategic locations can allow heat to be typically

[14] Existing buildings are less energy efficient than new buildings as less prescriptive construction standards applied at the time of construction. This means existing buildings will have a much higher heating demand than new buildings due to improved fabric performances. As a result, supplying low carbon heat to existing buildings will result in a greater potential for achieving CO_2 emissions savings.

transmitted up to 30km from the energy centre. This is based on utilising modern pre-insulated pipework (see Section 6.1).

As indicated in the *Powering Ahead, Delivering Low Carbon Energy for London,* DE schemes generally fall under three types, briefly described below.

Type 1: Single-Site Schemes

In these schemes, energy generation is based on small or medium scale CHP units, typically gas fired engines, with or without biomass boilers, according to planning requirements. This system would supply a single consumer type, or a small amount of mixed use, for example serving up to around 3,000 residential units or equivalent load. In the past, these schemes have primarily been developed by the public sector but are increasingly being incorporated in planning applications for major developments. An example scheme of this type is the Cranston Estate regeneration site in the London Borough of Hackney, which will connect over 500 residential units to a DEN consisting of approximately 1km of distribution pipework and a natural gas CHP engine.

Type 2: Multi-Site Mixed Use Schemes

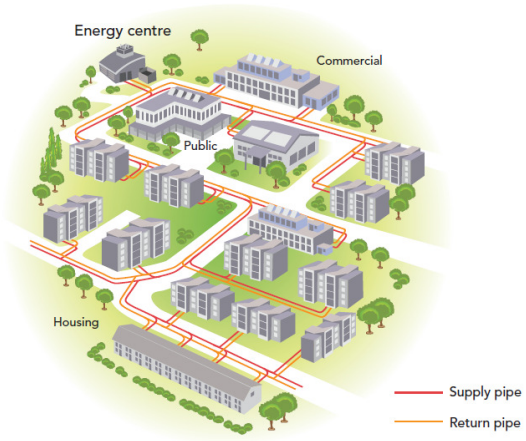
These serve more than one site and user type. The energy generation plant is based in a dedicated CHP energy centre and would serve from 3,000 to 20,000 residential units or equivalent load, along with a range of commercial, private and public sector consumers.

Type 3: Area Wide Heat Transmission Projects

These schemes consist of extensive heat distribution pipework systems forming a network of connected multiple heat producers such as power stations and industrial waste heat or energy from waste (EfW) facilities. They would serve 100,000 plus residential units and a large range of mixed public and private commercial facilities. A Type 3 example is the London Thames Gateway Heat Network (LTGHN), led by the LDA and Department for Communities and Local Government (CLG). The aim is to develop a low carbon district heating network in Europe's largest regeneration area. The heat network will incorporate heat from a number of sources, including low cost heat from Barking Power Station and heat generated by Tate & Lyle's industrial facilities. Heat will be distributed via an extensive distribution pipework main up to 67km long. The project's delivery is expected to be implemented over a three phase period from 2010 to 2019.

3.2. District Heating and Heat Mapping

The potential of district heating networks with CHP to reduce carbon dioxide emissions from the built environment derives from the scope to use the waste heat from power generation that would otherwise be wasted at conventional power generation plants. The benefits of district heating schemes largely depend on deployment being carried out in the right context.



Appropriate heat demand and density levels, a correctly combined demand from a mix of residential, commercial and industrial land uses, and the presence of anchor heat load heat consumers optimise the operational efficiency of a DE network. These three technical parameters are described in detail in Sections 5.1 and 6.1.

The development of a DE network should be based on an analysis of the heat demands within a certain area, known as heat mapping, that facilitates the evaluation of the potential for DE delivery against the technical criteria identified above, as a minimum. The heat mapping process will result in: the identification of clusters of potential heat consumers, serve to identify the density characteristics, understand the mix of uses, and pin point the anchor heat load consumers[15].

Additionally, the presence of existing and proposed energy generation centres should be considered in line with the categories recognised by the LDA (refer to paragraph 4.5). Although the energy centres are not considered an anchor load consumer, because they produce energy, their presence is still important in the identification of potential stakeholders that might be interested to contribute to or support the deployment of a DE network.

[15] These will be large, steady consumers of heat that are able to enter into long term heat supply contracts and consequently act as economic cornerstones for the development of heat networks.

4. METHODOLOGY

4.1. Introduction

In line with the project brief/specifications originally produced by the LBS, this Heat Mapping Study intends to delivering a heat mapping study focused around opportunities for and a road map towards the implementation of decentralised energy (DE) in the LBS.

This Chapter describes how data was collected in order to populate the relevant fields of the DEMaP database. Appendix D shows the format of the DEMaP database.

The DEMaP database is intended to inform the interactive London Heat Map[16] (LHM) (*Figure 4-1*) and therefore includes three categories of heat mapping information:

- Major heat loads (i.e. priority buildings),
- Heat supply plants; and
- District heating networks.

Each category includes a number of data fields, classified as 'mandatory' or 'desirable', based on their importance within the LHM.

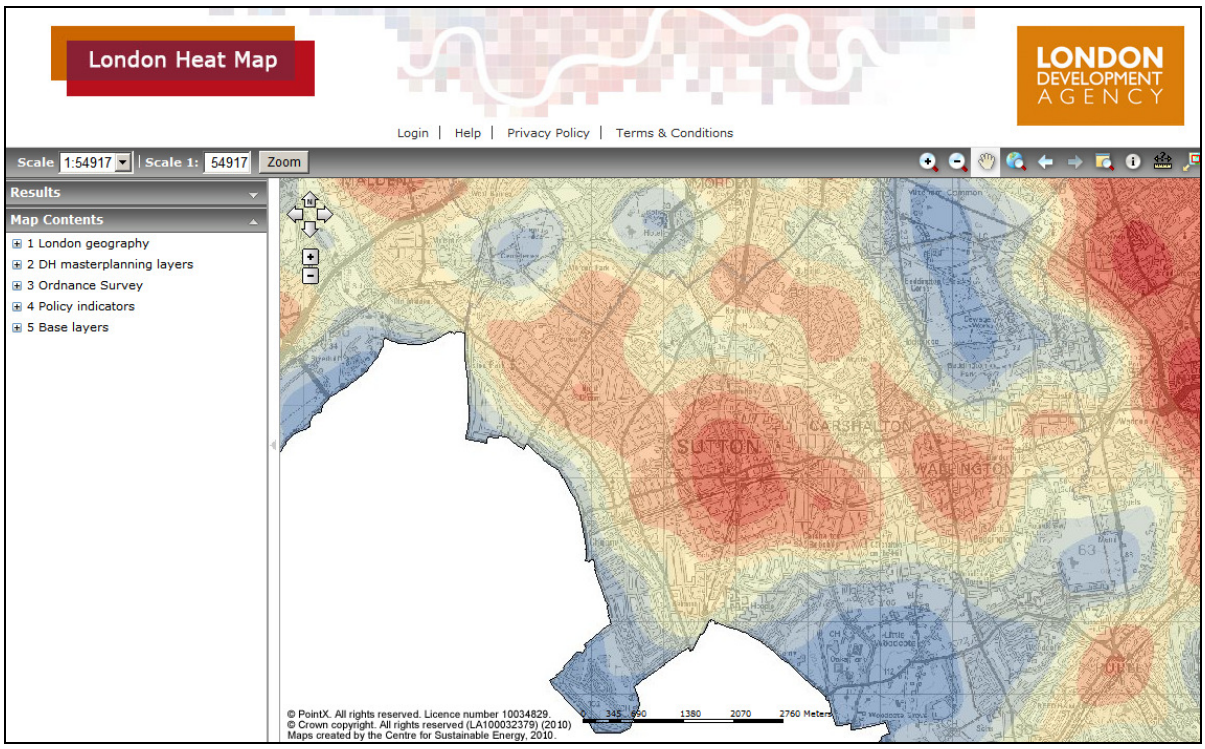
Therefore, data relevant to the heat requirements of high energy users (defined as priority buildings by the LDA) within the LBS were collected to help create a robust Heat Map for the Borough. The data collected was input into the DEMaP Database format provided by the LDA

The heat mapping methodology described in the next paragraphs of Chapter 4 consists of the stages following:

- Identification of the priority buildings (existing and new development);
- Collection of actual energy consumption data, or when this was not possible, benchmarking;
- Identification of existing heat plans and DH networks; and
- Identification of future development and creation of future growth trajectories up to 2026.

[16] http://www.londonheatmap.org.uk/Mapping/

Figure 4-1: London Heat Map Interactive Portal



4.2. Identification of Priority Buildings

The priority buildings were divided into several categories (identified in *Figure 4-1*) in accordance with the requirements of the DEMaP Database. Buildings in the LBS that were identified and included in each category were cross-referenced between several sources to ensure that all priority buildings were captured. Small-scale hotels, commercial and residential buildings were excluded from the database in accordance with the relevant thresholds provided by the LDA.

The following priority buildings' categories and thresholds were considered by the LDA:

- Education
- Sport and Leisure Centres
- Police Stations
- Fire Stations
- Multi-address buildings
- Sport & Leisure facilities
- Prisons
- Hotels (>99 units or 4,999m^2)
- Education facilities
- Police stations
- Fire stations
- NHS
- Central government estate
- Local government estate
- Museum & Art Galleries
- Churches
- Private residential (>149 units or 9,999m^2)
- Private commercial (>9,999m^2)
- Other public buildings.

The index of priority buildings produced by cross-referencing all available sources was then supplemented by desk-based analysis of the GIS data. GIS information was processed based on the building classification categories and building size. This ensured that the largest buildings within the Borough were captured in the database.

Details on the data collection sources for each priority building are provided below.

Schools

All educational buildings identified within the *UK Schools and Colleges Database* for the LBS and those identified on the LBS website were incorporated into the database regardless of their scale as no threshold was provided by the LDA. The building sizes range from small nursery schools to larger education complexes.

The following sources were used to identify priority educational buildings:

- Display Energy Certificates (DECs);
- LDA DEMaP Database current at the time of analysis;
- UK Schools and Colleges Database[17];
- LBS website[18]; and
- LBS GIS data: 'Schools', Address Point, MasterMap.

Sports and Leisure Facilities

All sport and leisure facilities identified within the Borough were incorporated into the database regardless of their scale, ranging from small gyms to large leisure centres.

Gyms located within large building complexes have not been incorporated into this category to avoid duplicate entries.

The following sources were used to identify sports and leisure facilities:

- Sutton's 'Sport Directory', dated 13/12/2006;
- LBS website;
- LBS GIS data: 'Outdoor', 'Sports', Address Point, MasterMap;
- LDA DEMaP Database current at the time of analysis; and
- Internet sources for local listings.

Hospitals

The following sources were used to identify hospitals within the Borough:

- LDA DEMaP Database current at the time of analysis;
- LBS GIS data: 'Hospit_1', Address Point, MasterMap; and
- NHS trust official website[19].

Police and Fire Stations

The following sources were used to identify police and fire stations in the Borough:

- LBS GIS data: 'Police_1', Address Point, MasterMap;
- LDA DEMaP Database current at the time of analysis;
- Metropolitan Police website[20], and
- London Fire Brigade website[21].

Museums and Galleries

The following sources were used to identify museums and galleries within the Borough:

- LBS GIS data: 'Theatres', Address Point, MasterMap;
- LBS website; and
- LDA DEMaP Database current at the time of analysis.

Local Government and Other Public Buildings

The following information was used to list the public buildings and local government buildings:

- NI 185 data;
- DECs;
- LBS GIS data;
- LDA DEMaP Database current at the time of analysis; and
- LBS website.

Hotels

According to the LDA thresholds, only hotels with over 99 bedrooms or 4,999m^2 should be included in the database. Based on these selection criteria, nine hotels were identified as priority buildings for the purposes of this Study.

The following sources were used to identify the relevant hotels within the Borough:

- LBS website;
- LBS GIS data; and

[17] http://www.schoolswebdirectory.co.uk, accessed October 2010

[18] http://www.sutton.gov.uk/index.aspx?articleid=2247, accessed October 2010

[19] http://www.nhs.uk/, accessed October 2010

[20] http://cms.met.police.uk, accessed October 2010

[21] http://www.london-fire.gov.uk, accessed October 2010

- LDA DEMaP Database current at the time of analysis.

Churches

All churches located within the Borough boundaries were included in the database. The following sources were used to identify churches:

- LBS GIS data: 'Places_1', Address point, MasterMap; and
- LDA DEMaP Database current at the time of analysis.

Private Commercial

According to the LDA thresholds, only developments of a gross internal floor area over 9,999m^2 should be included in the database; however, some of the important industrial parks and commercial developments were included even though they fell below the LDA threshold.

The Sutton Business Directory, which summarises approximately 40% of employers within the Borough (based on discussions with the Council), was used to determine the applicability of businesses as priority buildings, particularly within Sutton Town Centre.

Additionally, all multi-tenanted buildings, occupied by more than one company, were investigated and those with significant floor area were also included.

In summary, the sources used to identify significant Private Commercial buildings were:

- LBS data: Sutton Town Centre Health Check data, Examples of sustainable developments, Large vacant offices in Sutton Town Centre, Sutton Business Directory, Non-Residential Pipeline on 31 October 2010, Non-Residential Completions 2008-10, etc.;
- LBS GIS data: Address Point, MasterMap; and
- LDA DEMaP Database current at the time of analysis.

Residential and multi-address buildings

According to the LDA, housing association (HA), registered social landlord (RSL) and council housing of over 49 units should be included under the category 'Multi-address buildings'. Private residential developments of over 149 units, or over 9,999m^2, should be included under the category 'Private residential'.

The following sources were used to identify relevant residential developments in the Borough:

- LBS data: Council Housing Stock spreadsheet, Residential Pipeline on 31 October 2010, Housing Completions 2009-10, HA/RSL databases, etc.;
- LBS Waste Collection database;
- *Annual Monitoring Report 2008-2009*, Chapter 4 Housing, Map 4.3 (current at the time of analysis)
- LBS GIS data: Address Point, MasterMap; and
- LDA DEMaP Database current at the time of analysis.

4.3. Actual Energy Consumption Data

The second stage of the methodology entailed the collection of actual energy consumption data to populate the relevant fields of the DEMaP Database. For this purpose, a questionnaire was created, designed to reflect the data fields of the DEMaP Database. The questionnaire is attached in Appendix A.

An extensive phone survey (over 100 phone calls) was conducted to identity energy/facility managers in an effort to target the correct audience and maximise the relevance of the received responses. An email was then sent to the identified energy/facility managers providing the questionnaire. Where no response was received, the energy/facility manager was contacted a second time after a reasonable period, by phone, to follow up.

For the priority buildings contacted, only a 57% success rate was achieved in terms of determining an appropriate energy/facility manager.

Approximately 30 questionnaires were sent and a response rate of 12% was achieved.

Constraints associated with collating actual energy consumption data were realised during the Study, such as the difficulty in identifying relevant 'energy/facility managers' or other person with access to appropriate data. Additionally, some organisations had no incentive to provide their energy consumption information, especially in cases where such data was considered confidential. Further, some organisations were not able to respond within the timeframe of the engagement stage and, in some cases, energy records were collected and managed centrally at a head office for which contact information was not provided within the timeframe of the Study.

Finally, in addition to the questionnaires, actual energy consumption data for public buildings was also collected through Display Energy Certificates (DECs) and NI 185 data.

The combination of these sources resulted in gathering actual energy consumption data for over 20 buildings, representing approximately 7% of the total existing priority buildings.

Data collected through the questionnaires was analysed and then integrated into the DEMaP Database.

4.4. Benchmarking

Where actual energy consumption data was not available, a benchmarking exercise was carried out using LDA approved conventions to calculate the relevant input values requested within the DEMaP Database.

Energy consumption benchmarks for the applicable priority buildings were sourced from *CIBSE Guide F*, (typical practice buildings) and *BSRIA Rules of Thumb*. Benchmarks were chosen based on the nature of the building's function (i.e. office use, retail space, industrial accommodation, etc.). The LBS *OS Database* was then used to determine the footprint and number of floors of each building.

Benchmarks for residential buildings were sourced after consulting the following articles/publications:

- *CE309 – Sustainable refurbishment, Energy Saving Trust*, 2010 edition;
- *Energy efficient modernisation of housing: A UK Case Study*, Leeds Metropolitan University;
- *Phase 1 technical and energy modelling guidance notes v1.0*, CLG, August 2009;
- *Domestic Retrofitting Strategies in the UK: Effectiveness versus Affordability*, Architectural Association Graduate School, September 2006; and
- *Extreme low carbon dwelling refurbishment*, BSRIA, February 2010.

Where no actual information was available on building areas, these were estimated using the X and Y coordinates of the priority buildings and the Virtual London Building Heights GIS data.

4.5. Existing Heat Plants

To identify existing heat plants in the Borough, the following databases were consulted:

- London Energy Partnership's Community Heating Database;
- Department of Energy and Climate Change (DECC) CHP Database;
- The UK Heat Map;
- LDA DEMaP Database current at the time of analysis;
- LBS Corporate and Communal Boilers Database current at the time of analysis; and
- Office of the Gas and Electricity Markets (OFGEM) CHP Database.

The LDA DEMaP Database recognises the following types of heat plants:

- European Union Emissions Trading Scheme (EU ETS) sites
- CHP sites;
- Power plants;
- Energy-from-Waste (EfW) plants;
- Other low and zero carbon plants; and
- British Telecom (BT) exchange sites.

Other types of heat plants (e.g. boiler systems) are not recognised by the LDA. However, the location and capacities of these other types of heat plants (e.g. major boiler systems) in the Borough are strategically important for this Study because they represent an opportunity to connect the developments that they serve to a future district heating network (DHN).

No EU ETS sites, power plants or BT exchange sites were identified in the LBS.

However, the *Evidence Base Study 4, Technical Report* (October 2010), published in support of the South London Waste Plan: Proposed Submission document (January 2011) states that a new Anaerobic Digestion plant is proposed at Viridor's Recycling Centre at Beddington Farmlands which would treat 30,000 tonnes per annum of kitchen and garden waste arisings from Sutton, Croydon, Merton and Kingston (South London Waste Partnership Boroughs).

A planning application for this facility was submitted to Sutton Council in March 2010 (Reference D2010/62424) and at the time of writing, has not yet been determined.

It is proposed that the biogas produced by the anaerobic digestion process can be used by a CHP engine to generate electrical power and heat.

It should also be noted that under the terms of the current planning permission, all waste management activities on the Beddington Farmlands site will cease in 2023 upon completion of the landfill.

In addition to the above, based on the information collected and calculated for the DEMaP Database, URS identified existing buildings or building complexes that are more likely to be powered by communal heating (and CHP) systems. These were identified based on the following criteria:

- Energy Consumption: buildings with a large energy consumption;
- Building Use: the type of use of a building may also indicate that it is served by an energy centre. For example, leisure centres, hospitals,

colleges, Council buildings, high-rise office buildings and large shopping centres, were considered, and

- Floor Area: the building uses identified above were also filtered based on their floor area, i.e. large leisure centres were considered, whereas smaller gym facilities were less likely to be served by an energy centre.

Energy/facility managers of the buildings that met the above criteria were contacted with an information request via the questionnaire approach to determine whether the identified buildings actually accommodate heat plants. However, none of the priority buildings identified are served by a major heat supply plant falling under the LDA typologies.

The Sutton online planning register[22] was consulted in order to determine heat supply strategies for new major development proposals in Sutton. Based on the information included in the documents supporting the planning applications, a number of CHP plants were identified in the LBS and included in the DEMaP Database.

4.6. DH Networks

Based on the following sources, no existing district heating networks were identified in the LBS:

- London Energy Partnership's Community Heating Database; and
- *Powering Ahead, Delivering Low Carbon Energy for London*.

4.7. New Development

Output from the London Development Database (LDD) and the Sutton online planning register were used to list the new developments (i.e. Proposed Developments) in the Borough. Additionally, the Council also provided spreadsheets with the list of all the residential and non-residential developments in the pipeline on October 31st 2010. This information was filtered based on the LDA size thresholds (i.e. residential developments of more than 49 units, commercial spaces of more than 9,999 m^2 and hotels of more than 99 bedrooms).

Energy strategies, where available, were used to source data on anticipated fuel consumption. For the remainder proposed developments benchmarks from CIBSE Guide F (good practice buildings) were used for non-domestic buildings, whilst for the domestic buildings, energy demand in a range of domestic buildings compliant Part L1A of the Building Regulations, 2006, was used as a benchmark.

4.8. Future Development

The housing trajectory up to 2026 was provided by the LBS to inform the estimates of future heat demand (or gas consumption).

In line with the *Core Planning Strategy*, the trajectory has been provided for the Borough's key regeneration areas:

1. Sutton Town Centre;
2. Hackbridge;
3. Wallington District Centre;
4. North Cheam;
5. Carshalton;
6. Cheam;
7. Worcester Park;
8. Rosehill;
9. Beddington; and
10. Kimpton.

A baseline energy consumption position was established by using the Department for Business, Innovation and Skills (BIS) metered gas and electricity consumption data (2007), which are the most recent data at the time of writing. The BIS energy consumption data was analysed in combination with MasterMap topography data to demonstrate the actual heat demand/gas consumption characteristics (kWh/year) of the LBS based on a 250m x 250m grid format.

The growth trajectories were then developed by the Council as part of the LDF process using the best available information at the time of the Study, and have been used to provide an indication of the suitability of the identified areas for the integration of a DE network. These have been provided for the ten key regeneration areas and are presented in Table 4-1. For each time period, energy consumption benchmarks[23] were developed and applied to the Council's trajectory to obtain future energy

[22] http://213.122.180.105/FASTWEB/welcome.asp, accessed October 2010

[23] For residential and non-residential uses – *Supporting Regional Spatial Strategy Policy 39 (e)*, which includes benchmark energy consumptions (in kWh/m^2); Source: BRE, CP Energy Ltd, NaREC, and NEA: *Supporting Regional Spatial Strategy Policy 39 (e), Simplified Guidance Supporting Major Developments to Have Embedded Within Them a Proportion of On Site Generated Renewable Energy*

Energy consumption for hotels – *CIBSE Guide F*, *Energy Efficiency in Buildings*, January 2004

consumption estimates incorporating the proposed step changes in Building Regulations[24]. It should be noted that for the purpose of this Study the estimated reduction in energy consumption incorporates not only regulated energy uses (e.g. space heating, domestic hot water, lighting and ventilation), but also those resulting from non-regulated energy uses (e.g. equipment, appliances and cooking).

The resulting growth consumption figures were finally added to the BIS 2007 baseline figures to provide the future energy consumption up to 2026 (i.e. 2007 baseline consumption plus consumption growth by period).

[24] Part L 2010 Building Regulations will be applicable for buildings built between 2010 and 2013. Part L 2010 of the Building Regulations requires a 25% improvement in CO_2 emissions over Part L 2006. For the purposes of this study, only improvement associated with energy efficiency measures were considered to estimate the corrected energy consumption in 2010-2013, disregarding any improvement achieved through low and zero carbon technologies as this does not reduce the actual energy demand of a building. The improvements for the upcoming periods (i.e. 2013-2016, 2016-2019 and 2019-2026) were estimated similarly.

Table 4-1: Regeneration Areas, Housing Trajectories, Additional Number of units/bedrooms / Area [m^2] by Period

	Sutton Town Centre	2010-2013	2014-2016	2016-2019	2020-2026
units	Residential	300	750	900	1,800
m^2	Retail	0	0	60,000	60,000
m^2	Office	0	0	0	0
m^2	Industrial	0	0	0	250
m^2	Leisure	2,400	23,800	22,500	23,900
bedrooms	Hotel	5,000	0	0	5,000

	Hackbridge	2010-2013	2014-2016	2016-2019	2020-2026
units	Residential	750	750	750	1,000
m^2	Retail	0	50,000	50,000	50,000
m^2	Office	0	0	0	0
m^2	Industrial	0	0	250	0
m^2	Leisure	1,200	4,800	8,000	6,000
bedrooms	Hotel	0	0	1,000	5,000

	Wallington District Centre	2010-2013	2014-2016	2016-2019	2020-2026
units	Residential	500	700	0	0
m^2	Retail	50,000	50,000	40,000	40,000
m^2	Office	0	0	0	0
m^2	Industrial	0	250	0	0
m^2	Leisure	1,500	10,400	22,200	33,900
bedrooms	Hotel	0	0	0	0

	North Cheam District Centre	2010-2013	2014-2016	2016-2019	2020-2026
units	Residential	600	600	400	300
m^2	Retail	0	0	0	0
m^2	Office	0	0	0	0
m^2	Industrial	0	0	0	0
m^2	Leisure	4,000	0	0	0
bedrooms	Hotel	0	0	1,000	0

	Carshalton District Centre	2010-2013	2014-2016	2016-2019	2020-2026
units	Residential	0	0	0	1,600
m^2	Retail	0	0	0	0
m^2	Office	0	0	0	0
m^2	Industrial	0	0	0	0
m^2	Leisure	0	0	0	0
bedrooms	Hotel	0	0	0	0

	Cheam District Centre	2010-2013	2014-2016	2016-2019	2020-2026
units	Residential	1,100	100	0	0
m^2	Retail	0	0	0	0
m^2	Office	0	0	0	0
m^2	Industrial	0	0	0	0
m^2	Leisure	0	0	0	0
bedrooms	Hotel	0	0	0	0

	Worcester Park District Centre	2010-2013	2014-2016	2016-2019	2020-2026
units	Residential	1,100	100	0	0
m^2	Retail	0	0	0	0
m^2	Office	0	0	0	0
m^2	Industrial	0	0	0	0

m^2	Leisure	0	0	0	0
bedrooms	Hotel	0	0	0	0

	Rosehill District Centre	**2010-2013**	**2014-2016**	**2016-2019**	**2020-2026**
units	Residential	1,100	100	0	0
m^2	Retail	0	0	0	0
m^2	Office	0	0	0	0
m^2	Industrial	0	0	0	0
m^2	Leisure	0	0	0	0
bedrooms	Hotel	0	0	0	0

	Beddington Strategic Industrial Area	**2010-2013**	**2014-2016**	**2016-2019**	**2020-2026**
units	Residential	1,100	100	0	0
m^2	Retail	0	0	0	0
m^2	Office	0	0	0	0
m^2	Industrial	0	0	0	0
m^2	Leisure	0	0	0	0
bedrooms	Hotel	0	0	0	0

	Kimpton Strategic Industrial Area	**2010-2013**	**2014-2016**	**2016-2019**	**2020-2026**
units	Residential	1,100	100	0	0
m^2	Retail	0	0	0	0
m^2	Office	0	0	0	0
m^2	Industrial	0	0	0	0
m^2	Leisure	0	0	0	0
bedrooms	Hotel	0	0	0	0

5. HEAT MAP RESULTS

5.1. Introduction

As discussed in Chapter 3, in addition to heat demand and density levels, the operation and efficiency of a DE network is also optimised through correctly combining the demand from a mix of residential, commercial and industrial land uses.

In this chapter, an analysis focused on technical considerations is presented, structured in two stages:

- Firstly, existing conditions are discussed by analysing heat map results for existing priority buildings and new development proposals (i.e. pipeline development), to shortlist areas that present short/medium term opportunities for DE; and
- Secondly, future development incorporating longer term development proposals and policies will be considered to highlight how current opportunities for DE can be made more robust and how new opportunities can be fostered in areas where DE does not appear suitable in the short/medium term.

In the following sections, the framework underpinning the technical analysis is set out and the results of the two stage technical analysis are presented.

5.2. Framework for Analysis

Heat Demand and Density Levels

The presence of adequate heat demand and density levels is essential in supporting the feasibility of a DE network.

Density levels are reduced when the potential heat consumers are spaced further apart, whilst heat demand is also reduced when buildings are better insulated (i.e. when considering new and future development).

Historically, densities above 50 dwellings per hectare, e.g. a development of flats (> than 149 dwellings), have been used to determine when a district heating scheme should be implemented, based on economic parameters[25].

However, it should be noted that this study adopted a case-by-case approach when determining the feasibility or not to connect a development to a DE network.

Diversity of Consumer Types

A balanced/consistent heat demand is also crucial. DE schemes function on the principle of aggregating the heat demand of individual buildings and focus on managing the flow of heat through a set of buildings over the course of a day or year. This management of heat is based on balancing the demand profiles of different consumer types and seasonal demands for different energy services across the broad portfolio of property uses.

Specifically, different building types have different heat demand profiles/characteristics. For example, domestic applications offer peak heating demands typically between 7 to 9am and 5 to 10pm (domestic hot water led demand), whilst commercial and public buildings are more likely to peak at 6 to 7am (due to boiler start up functions) with a fairly consistent, low level heating demand throughout the day depending on occupancy levels (space heating led demand). There are also buildings which have consistent round-the-clock demand such as hospitals and leisure centres (process heating led demand). Connecting such different users produces an aggregate demand that offers smoother, more consistent heat demand characteristics than individual buildings, meaning heating plant can run significantly longer at the design output capacity. Therefore, this balancing of demand allows for the more efficient generation of energy and therefore optimised carbon dioxide emissions savings. This is quite unlike the erratic or spiky heat demand on an individual boiler in a home, and leads to a better DE plant performance and operational efficiency, the ability to install an optimised (reduced) plant capacity and, consequently, improved financial viability.

Anchor Heat Load Consumers

The presence of anchor heat loads is another factor affecting the feasibility of district heating networks. These will be large, steady consumers of heat that are able to enter into long term heat supply contracts and consequently act as economic cornerstones for the development of heat networks. Typically these will be public sector buildings such as hospitals, universities, Council facilities (including housing estates and offices), or hotels and leisure centres.

Existing Heat Plants

The location of any existing heat plants (as defined by the LDA) in the Borough is also relevant, as these provide opportunities to retrofit existing plant rooms/boiler houses (e.g. in housing estates) to support new plant and infrastructure. Furthermore, plant space in these locations is already available and identified for relevant use and therefore the installation of new plant facilities will encounter

[25] Energy Saving Trust, *CE299 The applicability of district heating for new dwellings*, September 2008

fewer barriers. Any existing heat plant in the Borough is assessed against identified strategic locations for the installation of future energy centres for new heat networks.

Where small heat networks have already been developed, these could form part of a new wider DE network. They may also contain a heat source that can be used either directly as a primary energy source or as future back-up. Small district heating networks, however, may have been sized to accommodate the intended load and have little capacity for expansion and therefore site specific feasibility studies may be required.

New and Future Development

Finally, new and future development can provide an ideal platform for creating a new district heating network that is able to connect to a wider area. A new development can act as the anchor load and as the site of any primary energy source/centre. This often makes the development of a wider DE network more viable as the initial asset provision (energy centre, plant and infrastructure) can be accommodated by the new development, particularly the upfront capital expenditure.

5.3. Stage 1: Existing and New Development

The location and energy requirements of existing and new priority buildings were mapped to relate their spatial distribution, and associated heat demand and density levels to an emerging strategic Heat Map for the Borough. The potential role of these buildings as loads for large and/or local scale district heating networks can then be identified.

The priority buildings (existing and new/proposed) with the highest heat demand identified through this Study are presented in *Table 5-1.*

Table 5-1: Large Heat Consumers in the LBS

Name	Ownership	Typology	Fuel (heat only) consumption (MWh/year)[26]
Royal Marsden Hospital	Other public	NHS	Above 10,000
St Helier Hospital	Other public	NHS	Above 8,000
St Nicholas Shopping Centre	Private	Private commercial (> 9,999m^2)	
Institute of Cancer Research	Other	Other public buildings	Above 6,000
St Anthony's Hospital	Other public	NHS	Above 4,000
Proposed – Felnex Trading Estate & Restmor Way	Private	Private residential (> 149 units or 9,999m^2)	
Times Square Shopping Centre	Private	Private commercial (> 9,999m^2)	
Proposed – St Helier Hospital	Other public	NHS	
St Philomena's School	Other public	Education facilities	Above 3,000
Asda Superstore, Sutton Town Centre	Private	Private commercial (> 9,999m^2)	
Durand Close	Local government	Multi-address buildings	
Proposed – Stanley Park High School	Other public	Education facilities	
Orchard Hill	Private	Private residential (> 149 units or 9,999m^2)	
Proposed – Azteque	Private	Private residential (> 149 units or 9,999m^2)	

[26] From all assets excluding CHP

Name	Ownership	Typology	Fuel (heat only) consumption (MWh/year)[26]
St Nicholas House	Private	Private commercial (> 9,999m^2)	Above 2,000
Homefield Park	Private	Private residential (> 149 units or 9,999m^2)	
Asda Superstores, Beddington	Private	Private commercial (> 9,999 m^2)	
Tesco Superstore	Private	Private commercial (> 9,999m^2)	
Morrisons	Private	Private commercial (> 9,999m^2)	
Marks & Spencer	Private	Private commercial (> 9,999m^2)	
Phase 4b & 5c – The Hamptons	Private	Private residential (> 149 units or 9,999m^2)	
Proposed – Durand Close	Private	Private residential (> 149 units or 9,999m^2)	
Canon House	Private	Private residential (> 149 units or 9,999m^2)	
Aspects	Private	Private residential (> 149 units or 9,999m^2)	
Civic Complex	Local government	Local Government Estate	
Quadrant House	Private	Private commercial (> 9,999m^2)	

Figure 5-1 overleaf illustrates the spatial distribution of the various consumer types identified in the Borough. These are represented by the priority buildings that include, as explained in Chapter 4, multi-address and residential buildings, hospitals, educational buildings, fire and police stations, local government and public buildings, museums and galleries, sport and leisure facilities, hotels, churches and commercial units/buildings.

To help visualise the heat demand and associated spatial characteristics of the identified consumer types, a Heat Map has been created where the priority buildings were plotted in Figure 5-2 with increased size to demonstrate increased heat demand. The heat demand of the priority buildings is linked through their gas consumption, which was determined using actual energy consumption data where available, and supported by a benchmarking approach where data was unavailable. Approximate gas consumption of the priority buildings was categorised as ‘very small’, ‘small’, ‘medium’, ‘high’, and ‘very high’, using the gas consumption of an equivalent quantity of dwellings.

Figure 5-2 also distinguishes between private (in blue), local government (in yellow), and other public buildings, such as hospitals, police and fire stations (in green). The map also shows in red buildings that do not fall into any of the above categories, such as churches. New development buildings in the Borough are indicated in purple.

The map also shows the location of existing heat supply plants (as defined by the LDA) in the Borough identified through this Study. Currently, only one existing CHP plant has been identified, i.e. the CHP unit at the Westcroft Leisure Centre in Carshalton.

It should be noted that the majority of existing heat plants in Sutton are boiler systems, generally with a capacity of less than 500kW.

These boiler systems are not recognised by the LDA and are therefore not included in the Database. Although not shown on Figure 5–2, the location and capacities of the major boiler systems in the Borough are strategically important for this Study because they represent an opportunity to connect the developments that they serve to a future district heating network (DHN).

Alongside the existing heat plants, the map also shows the major proposed heat plants. These consist mainly of CHP plant proposals (i.e. the potential hotel development at St Nicholas Shopping Centre, and St Elier Hospital and the Royal Marsden Hospital). Additionally, an AD facility is proposed at Viridor's composting facility in Sutton.

Figure 5-1 and Figure 5-2 demonstrate the spatial distribution and associated heat demand characteristics of the priority buildings (existing and new) in the LBS.

Figure 5-1: Priority Buildings in the LBS

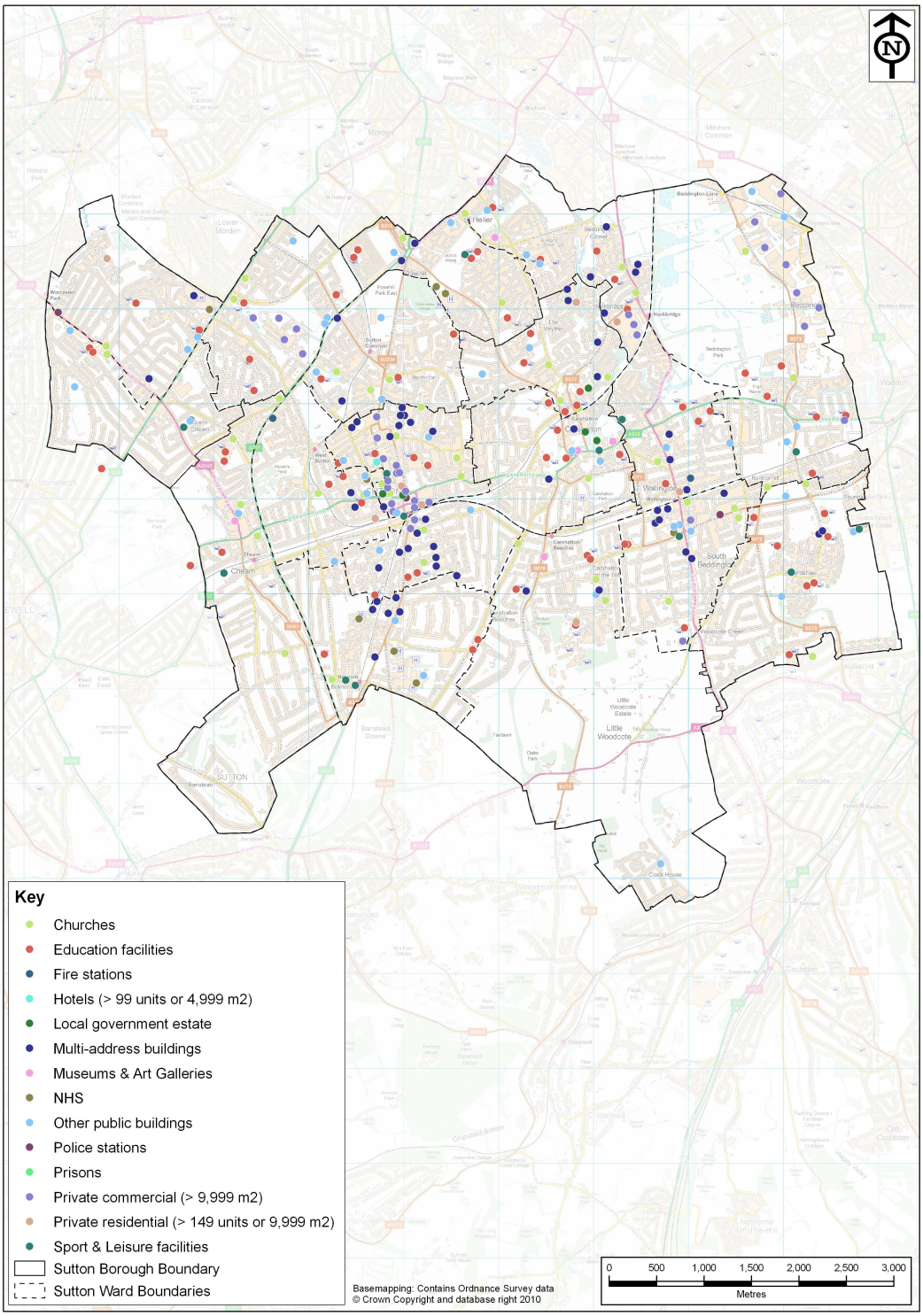
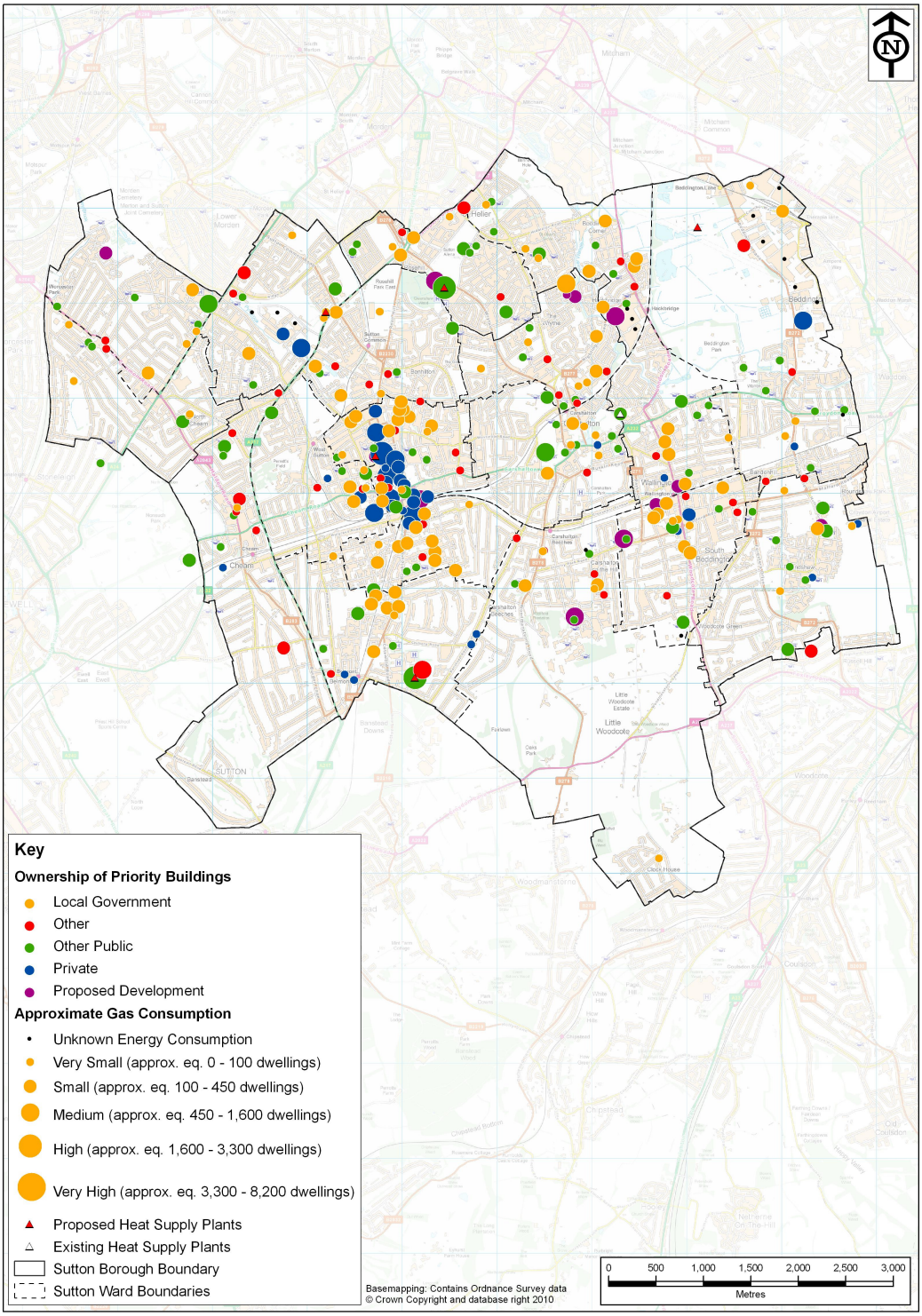


Figure 5-2: Heat Demand Characteristics of the Priority Buildings in the LBS



5.4. Stage 2: Future Development in the Regeneration Areas

Future demand methodology and results

Figure 5–3 and *Figure 5–4* show the baseline 2007 and forecast 2026 combined gas consumption spatial characteristics[27] for the Borough, respectively.

As discussed in Section 4.8, 2007 BIS metered gas consumption data was used to provide a baseline of the spatial heat demand (or gas consumption) characteristics across the Borough. The Borough wide figures are presented in *Table 5.2*.

Table 5-2: Baseline and 2026 Forecast Gas Consumption Summary (kWh)

	Baseline	Forecast
Domestic	1,264,392,389	22,147,445
Non-domestic	340,800,875	3,275,712
Total	**1,605,193,264**	**25,423,157**

Source: BIS 2007 (Baseline), URS Calculation (Forecast)

Having established the Borough baseline, additional growth in consumption has also been estimated, taking account of the proposed step changes in Building Regulations and continuing improvements in energy efficiency requirements.

The results of this exercise are illustrated for the regeneration areas in Table 5.3 and Table 5.4.

[27] It should be noted that gas consumption data is utilised to represent proxy heat demand characteristics for the purposes of the study. Additionally, combined gas consumption refers to the gas consumption associated with both residential and non-domestic buildings.

Table 5-3: Regeneration Areas, Forecast 2026 Gas Consumption Estimates per Land Use Type, kWh/year

Gas consumption (kWh/year)	Residential	Commercial	Industrial	Hotel	Retail	Leisure
Sutton Town Centre	7,144,337	549,947	0	1,030,427	462,826	401,943
Hackbridge	12,597,215	190,075	0	0	136,624	0
Wallington	1,722,845	0	0	0	3,242	0
North Cheam	145,124	0	0	0	741	0
Carshalton	134,248	0	0	0	0	86,018
Cheam	129,276	0	0	0	0	0
Worcester Park	145,124	0	0	0	0	0
Rosehill	129,276	0	0	0	0	0
Beddington Lane	0	0	209,142	0	0	0
Kimpton	0	0	204,727	0	0	0

Source: URS Calculations

Table 5-4: Regeneration Areas, Forecast 2026 Total CO_2 emissions (including gas and electricity) per Land Use Type, kCO_2/year

CO_2 emissions ($kgCO_2$/year)	Residential	Commercial	Industrial	Hotel	Retail	Leisure
Sutton Town Centre	3,457,082	586,428	0	282,886	1,560,422	203,391
Hackbridge	6,095,682	202,684	0	0	460,628	0
Wallington	833,670	0	0	0	10,930	0
North Cheam	70,224	0	0	0	2,498	0
Carshalton	64,961	0	0	0	0	43,527
Cheam	62,555	0	0	0	0	0
Worcester Park	70,224	0	0	0	0	0
Rosehill	62,555	0	0	0	0	0
Beddington Lane	0	0	1,929,169	0	0	0
Kimpton	0	0	1,888,447	0	0	0

Source: URS Calculations

Figure 5-3: Heat Map, BIS Baseline Combined Gas Consumption (kWhr per year), 2007

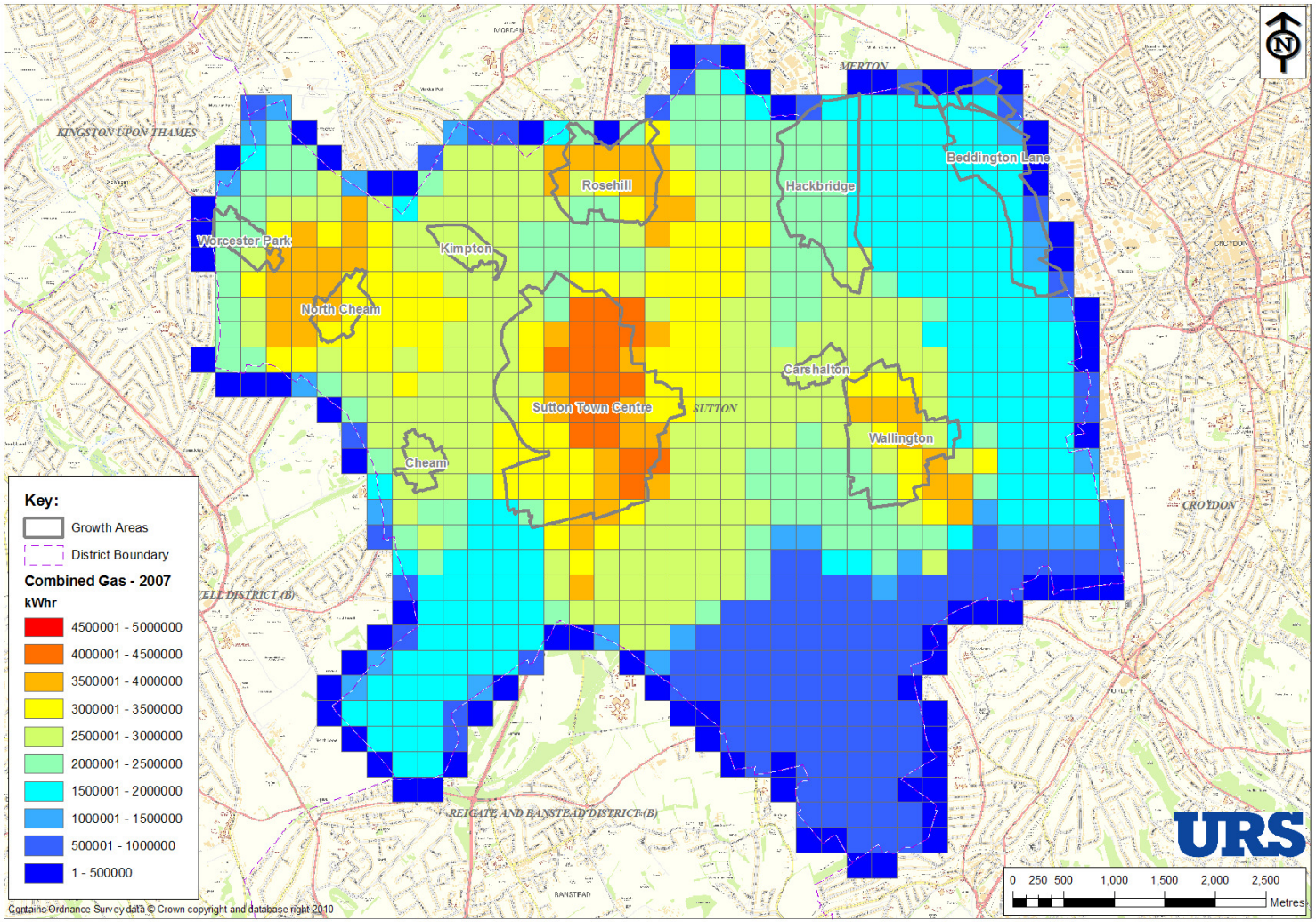
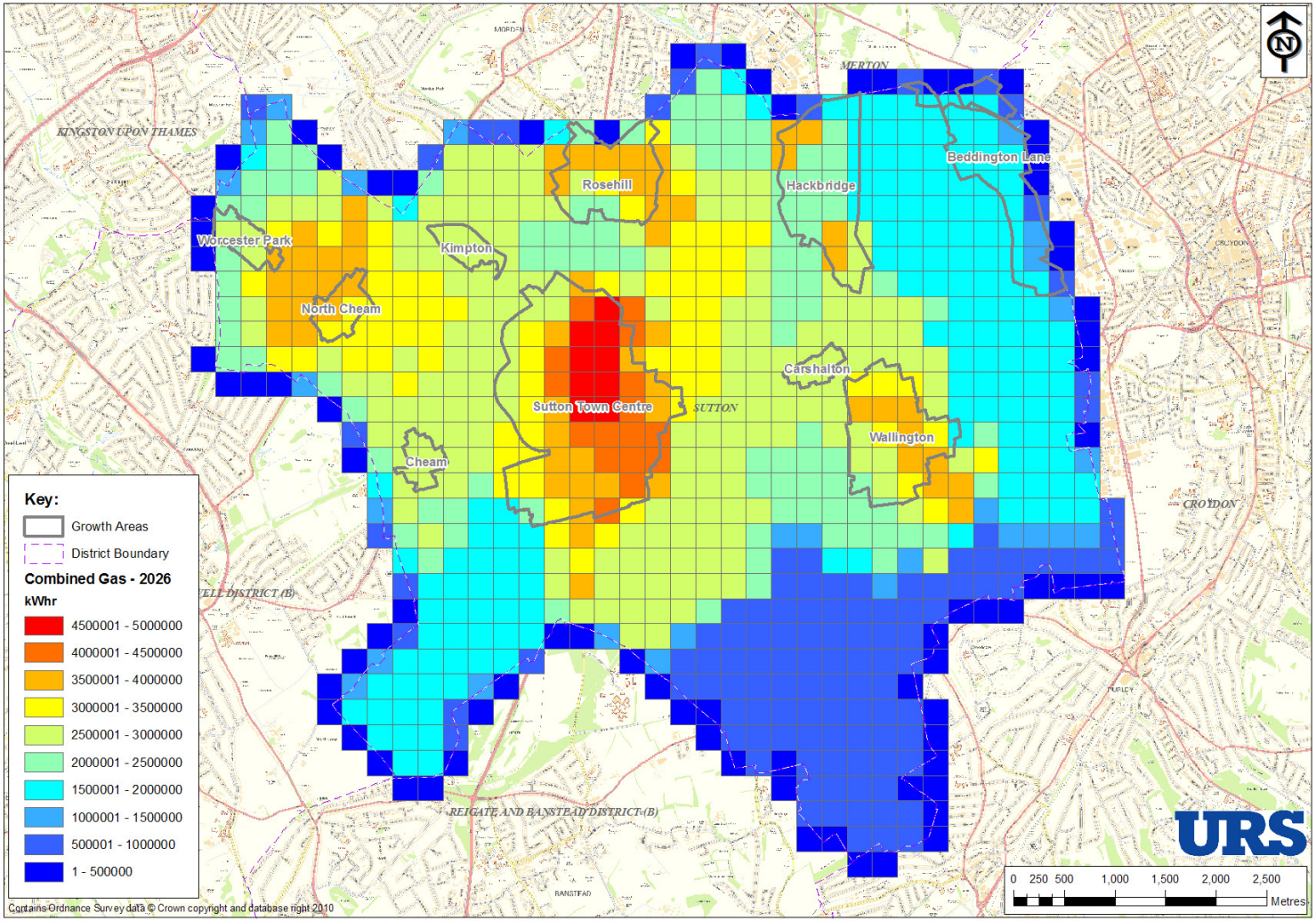


Figure 5-4: Heat Map, Forecast Combined Gas Consumption (kWhr per year), 2026



Heat Maps Analysis

Observations of the baseline 2007 and forecast 2026 combined gas consumption maps generally conform to findings of the priority buildings heat map, as follows:

- The highest area of gas consumption (shown in red and orange on Figure 5.4) is found in Sutton Town Centre, aligning with the density and heat demand characteristics observed in Figure 5-2;
- An area of medium gas consumption (shown in orange on Figure 5.4) is found in the area between North Cheam and Worcester Park, an area mostly characterised by low density residential use. This illustrates the predominance of domestic led heat demand in parts of the Borough. This zone, whilst initially appearing to offer feasibility as a shortlised area of DE opportunity, would be impacted by the high cost of connecting low density housing to a district heating network (connection costs are estimated in the order of £8,000 per terraced home).
- Similarly, a pocket of medium gas consumption is shown to the north of Sutton Town Centre (the Rosehill Area), mainly characterised by hospital and leisure facilities, and a large number of schools;
- Pockets of medium gas consumption are also shown in the Hackbridge Area and Wallington, generally in agreement with the clusters of priority buildings identified in these zones. In particular, the existing local centre of Hackbridge has been identified as a 'Centre for Growth and Regeneration'[28] involving a comprehensive redevelopment of the wider Hackbridge area to provide a district centre and a sustainable mix of homes, businesses, shops, and community and leisure facilities; and
- The gas consumption in the Beddington regeneration area is shown to be lowest than that of any of the other regeneration areas, a fact that may be attributed to the predominance of industrial land uses and the associated lack of heat demand.

Mapping the baseline 2007 and forecast 2026 combined gas consumption data (Figure 5–3 and Figure 5–4) supplemented the heat mapping analysis of the existing and new development (Figure 5–1 and Figure 5–2) to further validate the selection of the shortlisted areas of DE opportunity.

Both data sets indicate that the Sutton Town Centre, Hackbridge Area and Rosehill Area exhibit the correct technical characteristics whereby DE networks could potentially be deployed, both in terms of current (existing and new) and future heat demand. Therefore these three areas are deemed to be of high priority for the deployment of DE and a wider analysis extending to non-technical considerations is presented in the following chapter, alongside the potential for intra-borough and cross-borough connectivity.

The rest of the regeneration areas exhibit development constraints that would not sustain a DE network. Additionally, the gas consumption growth in these areas is not shown to increase significantly over the forecast period.

Initially, the shortlised areas of DE opportunity can be considered as follows:

High priority

- Sutton Town Centre;
- Hackbridge Area; and
- Rosehill Area.

Lower priority

- Wallington; and
- Beddington.

This is illustrated in Figure 5–5 and Figure 5–6.

[28] LBS, *DPD Core Planning Strategy*, December 2009

Figure 5-5: Shortlisted Areas of DE Opportunity – Heat Map Basemap

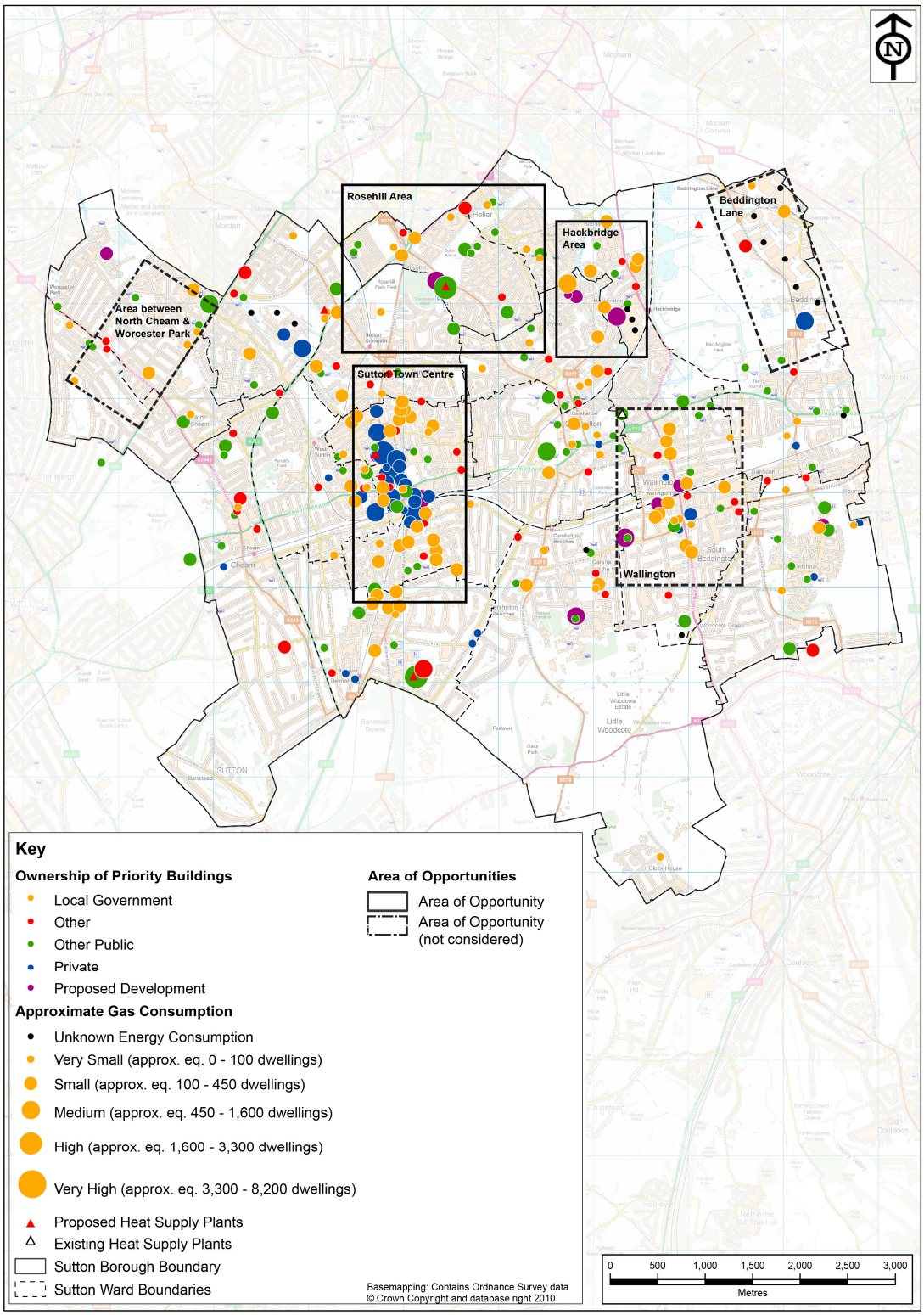
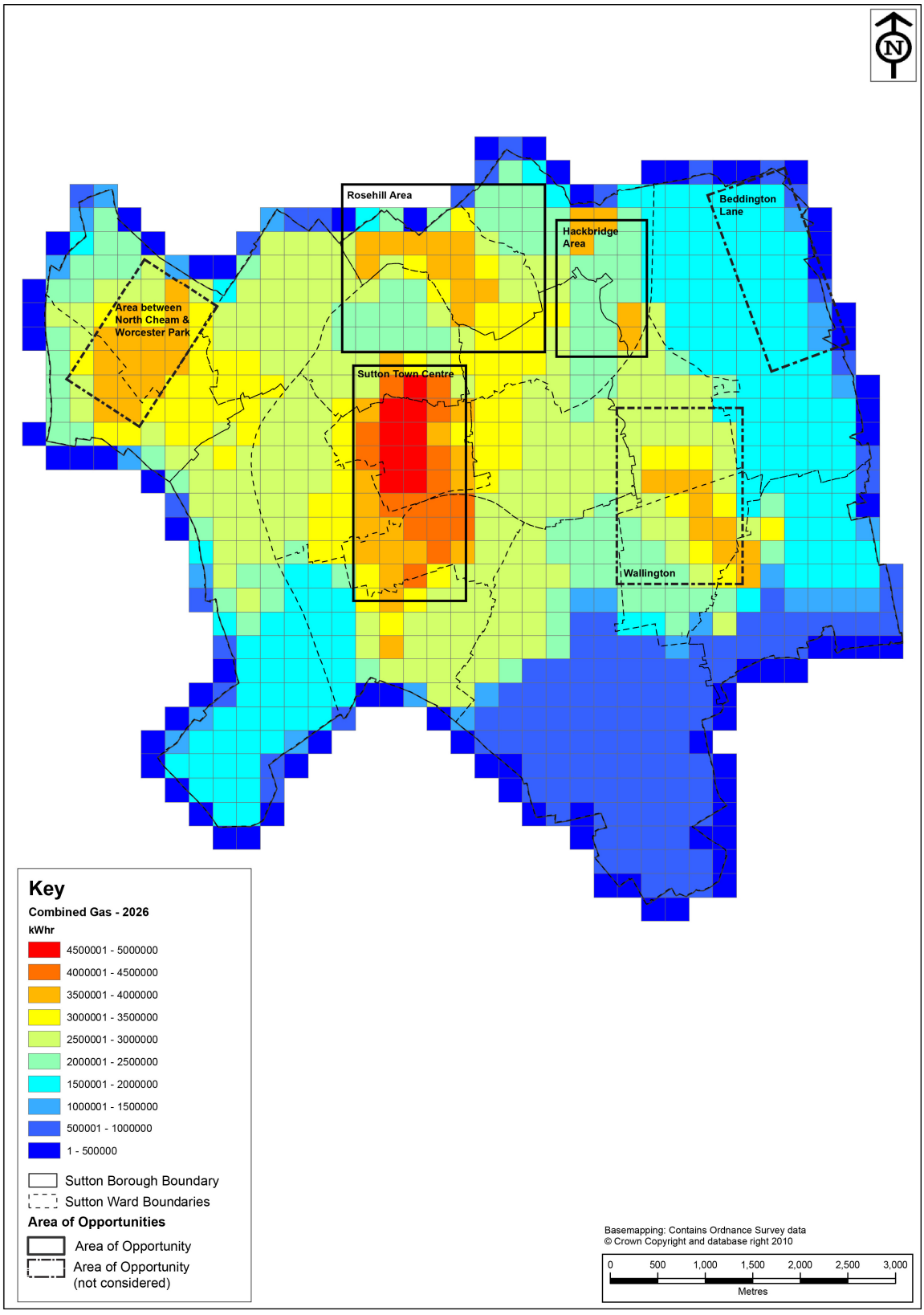


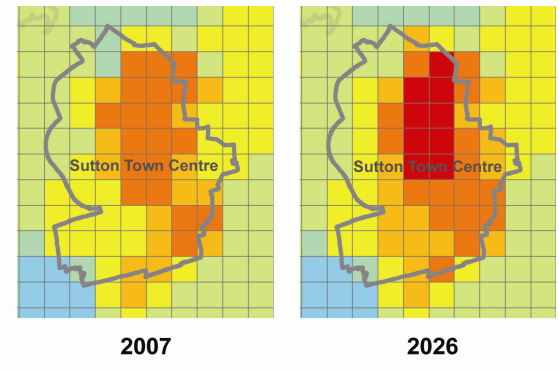
Figure 5-6: Shortlisted Areas of DE Opportunity – Forecast 2026 Combined Gas Consumption Basemap



5.5. Analysis

Sutton Town Centre

Figure 5–7: Sutton Town Centre Comparative Gas Consumption



Sutton Town Centre exhibits high heat demand and density level characteristics, the presence of anchor heat load consumers and a diversity of consumer types with a number of relatively large heat consumers concentrated in a small area (within a radius of approximately 300 metres). This cluster includes mostly commercial office and retail buildings with surrounding public and Council buildings. Economic CHP run time conditions (> 5,000 hours per year) are likely to be created that are well-suited for medium- to large-scale CHP plant supplying a district heating network. Additionally, the presence of anchor heat load consumers improves both the operation and financial merits of a CHP led district heating network.

Primary energy consumers in Sutton Town Centre include large shopping centres and department stores, such as the St Nicholas Shopping Centre, the Morrisons Supermarket, the Asda Superstore, Marks & Spencer, and the Times Square Shopping Centre.

The Borough has two shopping centres, both of which are located in the Sutton Town Centre. The largest of these is the St Nicholas Shopping Centre with three main levels and occupying a footprint of approximately 10,000m^2.

The St Nicholas Shopping Centre is the third largest heat consumer in the LBS, with an estimated gas consumption of circa 8,000MWh/year. Proposals also exist for a hotel development above the shopping centre. This priority building could act as a steady consumer of heat throughout the year.

The Times Square Shopping Centre is also a large heat consumer with an estimated gas consumption of circa 5,000MWh/year.

At either ends of the High Street are located the supermarket stores, Asda and Morrisons. They have been identified as large heat consumers with an estimated gas consumption ranging between 3,500 and 2,500MWh/year.

Another large heat consumer is the Civic Complex. This building is estimated to consume around 2,000MWh/year of fuel. Based on information provided by the Council, the heating to the building is provided via three boilers (i.e. two 850kW and one 350kW).

Offices buildings are also located in the Sutton Town Centre, such as Quadrant House and St Nicholas House.

Quadrant House is an air conditioned building completed in 1980. Currently it is occupied by Reed Business Publishing Group. According to a Case Study carried out on the Quadrant House[29], the building comprises two linked blocks with 20 and 7 floors, respectively. Two 2.5MW boilers (fitted with new gas burners in 1987) serve the air handling units and meet the domestic hot water space heating demand. According to the study, the building consumes 2,000MWh/year.

Additionally, this shortlisted area of DE opportunity is characterised by residential heat consumers (e.g. Homefield House) whose heat load is complemented by those of the commercial developments. According to the *Core Planning Strategy*, 40% of the residential development that is to occur in the Borough by 2016-2017 is proposed in the Sutton Town Centre.

A number of housing estates are located to the north of the Sutton Town Centre, such as Balaam House, Chaucer House, Killick House, Elm Grove, Homedale House, Belsize Court, Regency Court, Clevedon House, Hazelwood House and Oak Lodge. These housing estates are all grouped together and their heat demand is similar at around 800MWh/year. The ownership of these buildings is not known at present. The servicing strategy is currently only known for two estates, i.e. Balaam House and Caucher House, both heated via community boiler systems. These housing estates offer appropriate heat demand and density level characteristics, and their ability to act as anchor heat load consumers supports the technical feasibility of both DE network connection and energy centre provision (retrofit of existing boiler houses). Possible connection with a DE network should be investigated, e.g. assess plant replacement cycles, qualify ownership and engage the stakeholders.

According to information provided by the Council, a major residential development is to be located to the south of the Sutton Town Centre. The proposal is to

[29] *Good Practice Case Study 18, Energy Efficiency in Offices*, Department of Energy, April 1991

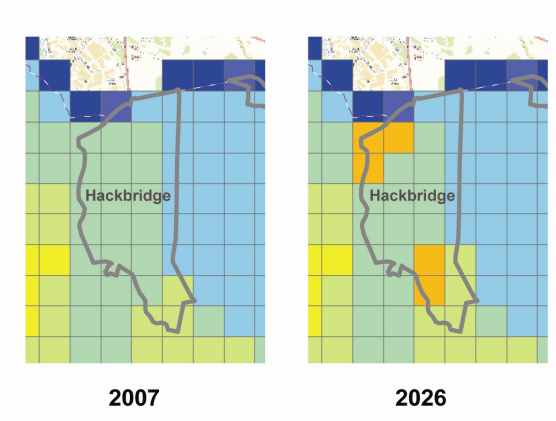
demolish Rafferty House and Sentinel House to support a new residential development (i.e. the Azteque private residential development), consisting of two towers of 13 and 14 storeys. The Council confirmed that the completion of this development is expected around early 2014. The ground floor (approx. 1,100m^2) would mainly occupy retail uses, car parking spaces, cycle spaces and associated landscaping, and provision for future pedestrian access to Sutton Station. The development proposals indicate that the scheme would be served by a community heating system utilising a biomass boiler.

Sutton Town Centre exhibits high heat demand and density level characteristics, the presence of anchor heat load consumers and a diversity of consumer types with a number of relatively large heat consumers concentrated in a small area (within a radius of approximately 300 metres). This cluster includes mostly commercial office and retail buildings with surrounding public and Council buildings. Economic CHP run time conditions (> 5,000 hours per year) are likely to be created that are well-suited for medium- to large-scale CHP plant supplying a district heating network. Additionally, the presence of anchor heat load consumers improves both the operation and financial merits of a CHP led district heating network.

The Sutton Town centre has been identified as an area with a strong potential for DE implementation. Additionally, as indicated in the *Sutton Town Centre Area Action Plan – Preferred Options Document*, the Council is keen to assess the capacity of Sutton Town Centre to accommodate renewable or low carbon technologies and evaluate the potential of decentralised energy infrastructure, such as CHP systems, to provide heat and power to new and existing development. It should be noted that the Core Planning Strategy Policy BP6 identifies STC as a 'low carbon zone'.

Hackbridge Area

Figure 5–8: Hackbridge Area Comparative Gas Consumption



The Hackbridge Area is identified in the *Core Planning Strategy* as a 'Centre for Growth and Regeneration'[30]. The Council aspires to carry out a comprehensive redevelopment of the wider Hackbridge area to provide a district centre and a sustainable mix of homes, businesses, shops, and community and leisure facilities.

Within the Hackbridge area, the established industrial areas such as the Felnex and the Wandle Trading Estates, and land north of Hackbridge Station provide opportunities for mixed use development (housing led). It is intended that the area comprising the Felnex and Kelvin House sites represent the most significant regeneration opportunity within Hackbridge[31]

The Felnex industrial area is currently occupied by several industrial estates. It is located in very close proximity to two local schools (i.e. Hackbridge Primary School and Culvers House Primary School), a railway line and an office/industrial area; comprising older industrial buildings, many of which have become vacant. The site is underused and the land could offer development efficiencies.

As a result, this site is the focus of a recent outline planning application that would see its regeneration through the construction of a number of residential led mixed use developments, including offices, retail, and residential (around 700 units) uses. It is expected that the proposed regenerated area would have gas consumption in the order of 5,000MWhr/year.

A number of residential developments are located in close proximity to the Felnex Industrial Estate, such as Mullards Close, Corbet Close (that is going to be demolished and redeveloped) and Foxglove Way. These residential developments comprise 91, 72, and 60 units, respectively. Their current gas consumption is comparable and is estimated at around 1,000MWh/year. However, it should be highlighted that heating to the Mullards Close and Foxglove Way residential developments is provided through individual electric heating. This servicing strategy is incompatible with DE network connection. As such they would be uneconomic to connect to a DE network. These properties are likely to be better suited to retrofit initiatives.

The Felnex regeneration hub is also in close proximity to the proposed residential developments at Durand Close and Kelvin House. According to information provided by the Council, the Durand Close development plans consist of approximately 400 units. It is estimated that the planned works would be completed by March 2016. Additionally, the Council confirmed that the outline application

[30] LBS, *DPD Core Planning Strategy*, December 2009

[31] *Hackbridge Masterplan*, Section 8, Development Brief: Felnex and Kelvin House

proposed the installation of two small CHP units generating 11% of the total site's energy requirements. The Council should recognise that the energy centre proposed for installation at Durand Close should be designed to allow future connection of other nearby sites. This can be easily accomplished with the provision of adequate plant space to support the potential expansion of the CHP system to serve other nearby heat consumers.

Kelvin House is centrally located within the regeneration area and, under the Hackbridge Masterplan, lies within the core regeneration area of Hackbridge. This site is currently a cleared site having been formerly occupied by a relatively tall office building. It is adjacent to Hackbridge Junior School and the Felnex Trading Estate. The site has gained planning permission for the following mix of uses: retail, offices, and residential (comprising 96 units). The Council confirmed that the development is not planned to be communally heated; however, future proofing has been allowed through the proposed installation of a sub-station capable of supporting electrical power export from a CHP system, and safeguarded plant space to facilitate future expansion and allow connection to a district heating network.

The South London Waste Plan[32] identifies the Wandle Valley Trading Estate (part of) as an industrial area with sites suitable for waste management facilities.

Additionally, the UK's first zero carbon housing development, BedZED, is also located within the Hackbridge area. This scheme was completed in 2001. However, as explained in the document "BedZED seven years on"[33], although energy use was designed to be reduced considerably and the remaining demand was designed to be met by CHP plant fed by locally-produced waste wood, since 2005 the domestic hot water has been provided by gas condensing boilers. Most of the scheme's electricity is supplied from the national grid with a proportion of renewable electricity being generated on-site by photovoltaic (PV) panels. BedZED is estimated to have an annual fuel consumption of approximately 1,300MWh/year.

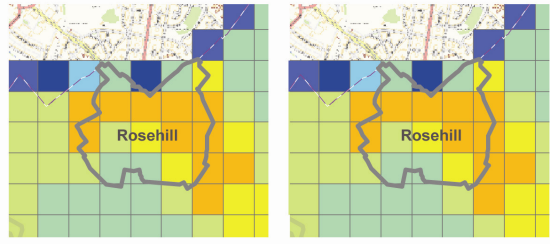
The Council is seeking to deliver the sustainable regeneration and growth of Hackbridge in line with 'One Planet Living' principles[34] and as 'Low Carbon Zones' under Core Policies PMP6 and PMP7, with 'zero carbon' standards to be achieved for all new development within the Hackbridge neighbourhood from 2011. As pointed out in the *Site Development Policies – Proposed Submission*, the Council is piloting the regeneration by promoting the role of renewable energy and decentralised energy infrastructure, including district heating and cooling networks, in achieving the 'zero carbon' standard in new and existing development from 2011.

Some work has already been initiated to assess the potential for delivering a sustainable suburb in Hackbridge. The *Multi Utility Sustainable Infrastructure Strategy* (*MUSIS*) study was produced by Inventa partners with the scope to assess the feasibility of delivering decentralised energy in Hackbridge. It shows that there is a significant energy market interest in the Hackbridge area in achieving the goal of 'zero carbon' through the provision of a district heating network. The report also highlights that the opportunity to utilise the biogas produced by the Viridor plant in Beddington (see *Beddington area*) would have genuine value and could be exploited relatively simply and cost effectively. The consultant's preferred strategy suggests that a district heating network in Hackbridge, i.e. a Low Carbon Link serving five developments inside Hackbridge (e.g. Felnex, Kelvin House, Wandle Valley, Durand Close and Corbett Close), could generate an income based on sales of heat and locally generated electricity. It is also likely that the Low Carbon Link would link to more than one energy centre.

As pointed out in the MUSIS study, an energy centre might be located at the Felnex Trading Estate on the basis that they will require an energy centre regardless of the overall strategy.

Rosehill Area

Figure 5–9: Rosehill Area Comparative Gas Consumption



A proposal to refurbish and expand St Helier Hospital has been granted outline planning permission. Combining the heat demand of the existing building and redevelopment proposals, St Helier Hospital will become the second largest heat consumer in the Borough with an estimated fuel consumption of almost 10,000MWh/year. A biofuel fired CCHP scheme is proposed to be built at the premises.

[32] *South London Waste Plan – Proposed Submission*, January 2011

[33] BioRegional, *BedZED seven years on*, July 2009

[34] LBS, *One Planet Action Plan*, December 2009

The Rosehill Area also contains a large number of educational facilities (secondary and primary schools), which surround St Helier Hospital.

To the west of the hospital is:

- Abbey Primary School;
- Tweedale Primary School;
- Green Wrythe Primary School; and
- Glastonbury Training Centre.

To the east of the hospital is:

- Muschamp Primary School;
- Wandle Valley Secondary School; and
- Carshalton Boys Sports College.

To the south of the hospital is:

- Greenshaw High School.

The Wandle Valley Secondary School and the Carshalton Boys Sports College are the largest heat consuming educational facilities within this regeneration area. Generally, the gas consumption of the schools ranges from between 100MWh/year up to 1,500MWh/year.

The Sutton Arena Leisure Centre is also located within this cluster of educational facilities surrounding St Helier Hospital. Two communal boilers serve the leisure centre building.

The anchor heat load consumer opportunities expressed by the presence of St Helier Hospital and the Sutton Arena Leisure Centre, the secondary heat consumers represented by the large number of educational facilities in the area, and the spatial arrangement of the priority buildings (i.e. within reasonably close proximity to a potential energy centre location at St Helier Hospital to support DE network distribution) demonstrates technical feasibility for DE implementation within the Rosehill Area.

Area between North Cheam and Worcester Park

This area includes mostly local government buildings, such as the Cheam District Centre, several schools (e.g. Dorcester Primary School, and St Cecilia's Primary School) and community centres (e.g. the Resource Centre and Adolescent Resource Centre).

St Anthony's Hospital is located in the northern part of this area. The current annual gas consumption of the hospital is estimated to be circa 5,500MWh/year.

This area presents a residential led heat demand.

One of the key industrial areas in the Borough (i.e. the Kimpton Industrial Estate) is located to the north of the North Cheam ward. Also, two private commercial buildings are located in close proximity to the industrial estate, i.e. the Tesco Superstore (with an estimated annual fuel consumption of approximately 2,500MWh/year) and the Capital House, a private office and industrial building with an estimated annual fuel consumption of approximately 1,500MWh/year.

However, according to the combined gas mapping exercise (*Figure 5–3* and *Figure 5–4*), the gas and electricity consumption of the commercial and industrial estates is limited when compared to other parts of the Borough, i.e. Sutton Town Centre.

Additionally, the heat demand associated with the local government buildings is not large enough to support anchor heat load provision and therefore the heat demand within this opportunity area would not support the implementation of a DE network. Additionally, the scattered location of the few priority buildings within this area does not favour effective network distribution.

Therefore the Area between North Cheam and Worcester Park has not been shortlisted for DE implementation in the short to medium term.

Although the spatial and forecast 2026 heat demand analysis in the Area between North Cheam and Worcester Park indicate less favourable conditions for DE delivery, this area would play a crucial part in facilitating cross-borough connectivity with the Royal Borough of Kingston-upon-Thames (RBKC) (refer to Section 6.4). Whilst the area falls short of meeting the technical criteria for DE implementation in the short to medium term, the ambitions for cross-borough connectivity could support DE delivery in the long term, .i.e. in the period between 2026 and 2050. The Council should seek to facilitate improved conditions for DE delivery through policy designations and longer term development proposals within this area to support the future prospects of cross-borough connectivity.

It is further noted that for areas where less favourable conditions exist for DE delivery, developers should still be required to assess the opportunities for DE provision within their development proposals in accordance with both the Mayor's energy hierarchy (be lean: use less energy; be clean: supply energy efficiently, i.e. utilise CHP technologies; and be green: use renewable energy sources), and heating and cooling hierarchy (i. connection to existing heating or cooling networks; ii. site wide CHP network; and iii. communal heating and cooling). This demonstrates best practice sustainable design principles.

Wallington District Centre

This area is located to the east of Sutton Town Centre. It is residential led with a cluster of medium size residential developments located within a radius of less than 500m. These buildings include Hendfield Court (64 units), Willow Court (84 units), Marlborough Court (56 units), Farmstead Court (67

units), Russel Court (88 units), Fairlawnes (56 units) and Coniston Court (55 units). These residential developments are all located along the London Road/Woodcote Road which crosses Beddington from south to north. Additionally, Canon House, a major residential development is also expected to be completed by June 2011. This development is located in Wallington North and, according to information provided by the Council, it would be heated through high efficient gas condensing boilers; although a recent amendment to the planning application proposes to provide space heating and hot water via exhaust air heat pump units.

This district centre is also occupied by local government buildings (e.g. Wallington Centre, Town Hall and Library) and schools (e.g. Stanley Park High School).

Industrial facilities are not prevalent in this area and only a medium size private commercial centre, i.e. Wallington Square, is present. Wallington Square has an annual fuel consumption of approximately 2,000MWh/year.

The Westcroft Leisure Centre is located to the north of the opportunity area. This building is considered a small/medium heat consumer. An on site CHP plant supplies the heat required to the building.

The growth in gas consumption for the area is limited, and the heat demand characteristics remain steady and stable. This area does not fulfil the technical criteria to support the implementation of a DE network due to a lack of a diverse consumer types and anchor heat load consumers, and low heat demand and density levels.

Therefore Wallington District Centre has not been shortlisted for DE implementation in the short to medium term.

Beddington Area

The Beddington Area is identified as Strategic Industrial Location (SIL) within Sutton's Core Planning Strategy (there are only 2 SILs in the Borough). Specifically, it is confirmed that the LBS' industrial land supply is dominated by the Beddington SIL, which comprises 70% of the total area and contains 55% of the total built industrial floorspace.

According to information provided by the Council, it is expected that Beddington will demonstrate the greatest industrial growth in the Borough.

There is a limited amount of residential or local government buildings in this area, offering minimal anchor heat load opportunities. The residential development of Douglas Close (120 units) is located within Beddington with some schools present nearby (e.g. the St Elpheges RC Infants and Junior School and Wilson Grammar School).

Commercial and retail development is not present in the area other than one large heat consumer located to the north of the area, i.e. the Asda Superstore. It is estimated that this building has a fuel consumption of approximately 3,000MWh/year.

The Beddington area is industrial led and, as a result, its heating demand is minimal. This is due to the typical servicing strategies for the predominating warehouse units whereby space heating is very rarely provided (large exposed warehouse spaces) and domestic hot water is electrically driven. This servicing strategy is not compatible with connection to a DE network. Therefore, in view of the proposed DE study, this area has not been shortlisted for DE implementation in the short to medium term.

Up to 7 hectares of waste development will be permitted within the Beddington Strategic Industrial Area and the Wandle valley Trading Estate over the plan period.

All the residual municipal solid waste currently collected among the four partner Boroughs is currently disposed of at the Beddington Farmlands landfill site within Sutton operated by Viridor.

40% of all of the Borough's recyclable waste (i.e. all kitchen and garden waste) is treated at Viridor's In-Vessel Composting Facility at Beddington Farmlands.

Landfill gas is currently utilised to generate electricity for export to the grid. In 2005, Viridor submitted a planning application (Ref: D2005/54794) for an AD facility at the Beddington Farmlands Landfill site which would treat 75,000 tonnes per annum of waste per annum to generate electrical power and heat. A resolution was reached by the Council to grant approval in April 2008 subject to the negotiation of section 106 agreements. In 2010, Viridor submitted a revised planning application for AD (Ref: D2010/62424) which proposed a reduced capacity from 75,000 tonnes per annum (tpa) to 30,000 tpa of source segregated kitchen waste. However, in accordance with the terms of the existing temporary planning permission for waste management activities at Beddington Farmlands, the proposed AD facility would cease in 2023 upon the completion of the landfill.

Its location is considered to be strategic for the deployment of DE networks in Sutton, and particularly in Hackbridge. The Council's focus should be on this area supporting 'zero carbon' energy delivery in Hackbridge through biogas production and utilisation within a CHP led district heating network.

Baseline and Forecast Gas Consumption Comparison

Figure 5–7, *Figure 5–8* and *Figure 5–9* compare the baseline 2007 and forecast 2026 combined gas consumption characteristics of the shortlisted DE

areas of opportunity. *Table 4-1* and *Table 5-3* present the development growth projections and forecast gas consumption figures for the regeneration areas in the LBS, respectively.

By comparing the gas consumption growth in the shortlisted DE areas of opportunity, it can be seen that only a marginal growth/change in gas consumption is demonstrated. This is due to the following:

- Typically, the existing building stock will make up approx. 85% of the building stock in 2026, i.e. the forecast gas consumption for 2026 is predominantly made up by the existing building stock (or 2007 baseline); and
- The new and forecast building stock will offer significant improvements in energy efficiency performance, driven by the predicted step changes in Building Regulations and the Code for Sustainable Homes Level requirements when considering residential development. The 'zero carbon' housing trajectory from 2016 onwards and the 'zero carbon' non-domestic development trajectory from 2019 onwards, means that the heat demand (or gas consumption) of the new and forecast building stock will be significantly less than the less energy efficient existing building stock. This has a significant impact on the forecast gas consumption growth in the regeneration areas considered.

5.6. Summary

A spatial and demand analysis of the priority buildings and forecast 2026 combined gas consumption in relation to the criteria outlined in Section 5.5 indicate that there are generally three areas of opportunity that can be shortlisted for the deployment of DE within the Borough. These largely coincide with the regeneration areas of Sutton Town centre, the Rosehill Area and the Hackbdrige Area.

The shortlised areas of DE opportunity emerging from the technical analysis are:

- Sutton Town Centre;
- Rosehill Area; and
- Hackbridge Area.

6. SPATIAL OPPORTUNITIES FOR DECENTRALISED ENERGY

6.1. Framework and Criteria for Analysis

Chapter 5 identifies three areas of highest priority in the short to medium term for the implementation of DE based on an assessment of existing priority buildings, and new and forecast development against technical and spatial criteria for DE delivery.

These areas are further assessed in this chapter against a wider range of criteria adapted from the *HM Treasury Five Case Model*[35] offering a practice guide for programme and policy evaluation. The criteria applied to the shortlisted options are listed and described below.

Technical

Sufficient heat demand and density levels

Density levels of heat consumers are determined by the proximity of high heat demand consumers to each other when assessing the ability to support connection to a district heating network.

In terms of physical extent, i.e. network coverage, there are upper limits to the coverage of a district heating network, based on CHP energy centre provision. Where a district heating network is served by a single energy centre with no satellite energy centres, the extent of the network typically reaches a 3km radius. This 'rule of thumb' is determined by pipework heat losses and the operational temperature of the network. The greater the network coverage area, the higher the operational network temperature will need to be to facilitate the correct heat supply temperature to the connected consumers.

Where networks exceed this typical 3km coverage area, local top-up boiler systems/ energy centres will be required to maintain the correct operational network temperature, potentially increasing the reach of the network to up to 30km.

Moreover, the costs associated with laying the necessary pipework infrastructure also increase with increased distances. Therefore, the proximity of potential strategic energy centre sites (strategic locations) and the connected consumers is a crucial consideration in the evaluation of opportunities for DE.

[35]http://www.hm-treasury.gov.uk/data_greenbook_business.htm

Sufficient diversity of consumer types

Correctly combined demand from a mix of residential, commercial and industrial land uses would optimise the operation of a DE network.

For example, residential load profiles for domestic hot water tend to have pronounced morning and evening peaks (see Section 5.2). To maximise the benefits of a CHP system, the installation of a large thermal store (i.e. hot water storage tanks) will be required to meet the peak time demands in order to support economic plant capacities and run times. A mix of uses alongside the residential use, however, would help to create daytime loads, reducing the need for thermal storage capacity and help to improve CHP operational feasibility. Use of larger public sector sites (e.g. Council offices and housing estates), commercial offices and hotels creates a more consistent and robust load profile.

Anchor load consumers

An anchor heat load may be defined as a large, steady consumer of heat that will form the core of a DE network. This would be a site well suited to CHP with high and relatively constant heat (and ideally electrical) demand.

Other potential anchor loads consumers include sites with existing CHP/community plant installations or buildings already linked via a district heating network.

Public sector sites (e.g. Council offices and housing estates) are preferred as they present typically lower commercial risk and may be able to 'drive' the feasibility of a DE network. This is, in part, due to Councils being able to enter into longer term heat supply contracts with Energy Services Companies[36] (ESCos), thus ensuring commercial viability.

Technical constraints

Existing buildings that are served by electrically driven heating systems (e.g. Variable Refrigerant Flow – VRF – fan coil unit systems, electric panel heaters, point-of-use domestic hot water systems, etc.) cannot generally support connection to a district heating network without major plant refurbishment and structural modifications. This would a pose significant cost burden on building owners and operators.

Existing buildings that have central heating systems already in place (e.g. four-pipe fan coil unit systems,

[36] The term ESCo refers to a wide range of different energy supply arrangements under which an ESCo acts like a utility provider but instead of supplying gas, heat is supplied. ESCos usually install, finance and manage community energy systems and therefore provide an efficient and comparatively lower risk approach to CHP installation management.

See Section 7.4 for a more extensive discussion on ESCOs and their potential role in Sutton.

wet radiator systems, central calorifier plant providing domestic hot water services, etc.) offer a better potential for district heating connection but are still constrained by asset/plant replacement programmes, whereby sufficient funds will only become available at the end of the life of the plant to support upgrading and a potential district heating connection.

A number of other technical constraints will need to be considered at more advanced planning stages to ensure the feasibility of proposed DE schemes[37]. This is particularly true for constraints relevant to linking a network to existing utilities, infrastructure and systems. Investigating these issues at such an early stage of analysis is difficult, i.e. more advanced and detailed plans would be required to undertake specific statutory searches to identify existing utilities networks.

In Chapter 7, potential ways of overcoming such limitations are identified to progress the implementation of DE networks in the Borough.

Environmental constraints

These may include air quality and noise impacts on nearby sensitive receptors that can affect resident perceptions on CHP energy centres. Environmental impacts largely depend on the scale and technology used for an energy centre and therefore further consideration should be given to such issues on a case-by-case basis.

Environmental impacts can generally be mitigated with proper design and use of best available technologies. Developments proposing to incorporate CHP plants would need to demonstrate how these constraints are overcome to ensure any proposals will be received positively by the Council and local residents.

Chapter 7 highlights the next steps that would have to be followed in the later stages of the DE implementation process and study.

[37] These include, among others:

- Whether the National Grid is likely to be able to respond to and support the delivery of the identified DE schemes (e.g. a gas fired CHP plant), i.e. ensure sufficient grid infrastructure/assets are in place to support the export of electricity to the grid;
- Whether any proposed large scale, gas fired CHP plant is appropriately located in close proximity to a medium pressure gas mains, as this is more likely to support the financial viability of DE projects due to the requirement for gas infrastructure reinforcement and gas compression plant; and
- Whether a proposed DE scheme is located in an area that is congested with existing utilities infrastructure, affecting network distribution.

Strategic

Local, regional and national strategic fit

DE schemes in the areas of opportunity are required to contribute to meeting climate change and energy security policy objectives at the Borough, London-wide and national levels.

Financial

Financial risk

DE schemes in areas with a high number of different landowners, particularly if private, are likely to be more financially risky than those in areas with a more concentrated land ownership or where large anchor heat consumers exist, e.g. public sector buildings. When ownership is fragmented, particularly across private stakeholders, financial incentives are likely to be required.

Cost implications

Insufficient heat demand and density levels, absence of an adequate mix of consumer types and the lack of anchor heat load consumers are all likely to result in higher capital and operational costs, and greater levels of commercial risk for DE schemes. Any specific technical or environmental constraint can be expected to have a similar effect.

With regards to CHP, engine capacity is a key consideration to assess the likely commercial viability of the scheme for ESCos. A higher cost per kilogram of CO_2 emissions saved (kg/CO_2) is likely to reduce the viability of a DE network.

Also, variations in the total capital and operational expenditure among the range of emerging opportunities could mean that higher cost options are less likely to be financially viable for the stakeholders. This element will be considered when a spatial strategy for renewable energy in the Borough is developed.

Funding opportunities

Limited opportunities to access a range of public funding sources or subsidies are likely to limit the potential for implementing DE schemes.

If the level of new and future development in an area is high, and led by a limited number of stakeholders, then greater opportunities arise for the Council to negotiate with developers to introduce a DE network or contribute funding towards the retrofit of existing properties to support connection.

Currently, Policy DM6 (part D) states that where compelling reasons can be demonstrated that achieving the relevant carbon dioxide reduction targets on or near site would not be technically feasible or economically viable, the Council will negotiate Section 106 agreements with developers to fund the delivery of carbon reduction measures off-site through the 'carbon offset fund' in accordance with further guidance to be provided in the Council's Climate Change SPD.

Policy DM6 (part E) states that all planning applications for new dwellings or major non-residential developments should be accompanied by an Energy Assessment to demonstrate how the relevant targets for reducing carbon dioxide emissions and promoting renewable energy technologies will be met.

In seeking to apply the second step of the Mayor's energy hierarchy in line with Policy DM6 (part C), the supporting text to Policy DM6 incorporates a 'DE Protocol' in order to ensure that proposed developments are designed to connect to and, where appropriate, contribute towards the delivery of DE infrastructure supplied by renewable or low carbon energy technologies.

Economic

Wider economic benefits

Economic impacts from the implementation of DE networks are likely to affect a range of stakeholders, including: utilities companies, developers, residents and businesses in the Borough, the Council itself, and the wider London/national economies. Of particular importance are general benefits to individual building and business owners (outlined below), as these constitute a possible leverage to raise interest and reduce deliverability risks.

At a later stage, when feasibility studies are undertaken, additional consideration should also be given to utilities and traffic disruption costs that are avoided.

The benefits to business, and building owners and occupiers who connect to the decentralised energy network will be specific to the individual building or business, depending on its size and requirements. The general benefits can be summarised as follows:

- Lowering of carbon dioxide emissions through the use of CHP will have a positive reflection on the value of the owner's building portfolio and overall corporate social responsibility targets/ratings;
- Potentially released boiler space, which can be utilised for other purposes. Heat exchanger plant can be accommodated within a smaller plant space than the boiler plant replaced;
- Potential savings on boiler maintenance. There will be savings on maintenance costs when redundant boilers are removed. Boiler maintenance generally costs £1,500 pa per boiler, and
- Savings on boiler replacement. The costs of new boiler plant may be in the order of £25,000.

Savings on boiler replacement and maintenance are also direct benefits for residents and tenants, In addition, wider economic benefits for these groups include:

- Fuel poverty alleviation;
- Increased heat supply security; and
- Opportunity for behavioural change through raising awareness of an individual's energy consumption.

Contribution to CO_2 emissions savings targets

The implementation of DE schemes can contribute to meeting local, regional and national carbon dioxide emissions savings targets. The predominant drivers are at a regional level. The Mayor's *Climate Change Action Plan* (*CCAP*) sets out a target to provide 25% of London's energy needs through decentralised energy sources by 2025. In addition to this, the Mayor's *Energy Strategy* sets out a commitment to achieve a 60% savings in London's CO_2 emissions by 2025 (based on 1990 levels).

Deliverability and management

Delivery opportunities

Existing energy centres offer an opportunity for the deployment of DE networks, particularly if maintenance and asset/plant replacement cycles are aligned with new and future development in the area.

Delivery risks

The presence of a high number of different priority buildings with different ownership is likely to result in a higher delivery risk, requiring commitment from a large range of stakeholders. For this reason, the presence of anchor heat load consumers, and particularly public sector consumers, is likely to reduce the delivery risk.

The commercial viability for ESCos to operate DE networks in the areas of opportunity and the Borough as a whole is a key consideration, which will be driven by the other factors discussed in Section 6.1.

Political risks

Environmental constraints and negative public perceptions on specific DE schemes may mean that the Council needs to actively engage with local residents, businesses and developers to ensure they support the Council's drive for DE in Sutton. Stakeholder engagement would allow benefits to be disseminated such that any particular issues raised are addressed effectively.

Management

Generally, the greater the number of players in a partnership the more complex and difficult it is to pursue and achieve objectives. However, this needs to be balanced with the advantages of involving key organisations. At this stage an assessment of potential implications for the management of a DE network is limited by the strategic nature of the options discussed. It is essential to have a governance structure that involves partnerships with developers and local stakeholders (as in Hackbridge).

In addition to undertaking the design, finance and build of a decentralised energy system, an ESCo is also well placed to undertake the operation and management of the system. Once the energy centre and infrastructure has been established, an ESCo can ensure continuity of the fuel supply chain, operation and maintenance. Depending on the contract terms, ESCos can also manage metering and billing.

Chapter 7 highlights the next steps that would have to be followed in the later stages of the DE implementation process and study.

6.2. Results

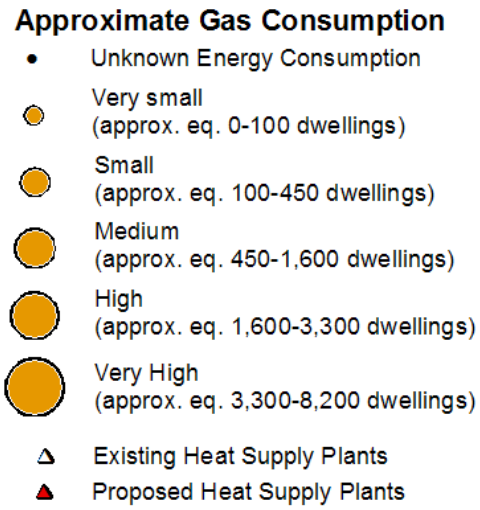
Under each area of opportunity, specific sites, categorised against the Priority Buildings categories highlighted in Chapter 5, i.e. Local Government, Private, Other Public, Other and Proposed Development, are discussed in further detail to support the framework findings.

At this stage of heat mapping, technical considerations are a key driver of the analysis, due to the standard DEMaP scope of works, which emphasises the technical assessment of priority buildings. The implications of the technical characteristics of the areas considered, in terms of strategic fit, financial and economic impacts, and deliverability and management, have also been incorporated in the framework for analysis. They are also given consideration in the final chapters of this report, when the Implementation Plan is outlined and Next Steps for the delivery of DE are identified.

Below are the results of the analysis for each of the shortlisted areas for opportunities. Area specific maps illustrate priority buildings in each area, namely:

- Private (in blue);
- Local government (in yellow);
- Other public buildings, such as hospitals, police and fire stations (in green);
- Buildings that do not fall into any of the above categories, such as churches (in red); and
- Proposed developments in the Borough are indicated in purple.

As in *Figure 5-2*, the heat demand of the buildings identified through this study is associated with their gas consumption (as a proxy to heat demand), categorised as 'very small', 'small', 'medium', 'high', and 'very high', using the gas consumption of an equivalent quantity of dwellings as indicated in the legend below. The equivalent quantity of dwellings does not correspond to the actual number of dwellings on site; it is just an alternative unit of measure.



Sutton Town Centre

Specific sites

The specific sites identified under the Priority Buildings categories are:

Existing Developments:

- Other Public:
  1. Civic Complex.
- Private:
  1. St Nicholas Shopping Centre;
  2. Quandrant House commercial development;
  3. Times Square Shopping Centre;
  4. St Nicholas House commercial development;
  5. Homefield Park residential development;
  6. Morrisons;
  7. Asda Superstore; and
  8. Marks & Spencer.

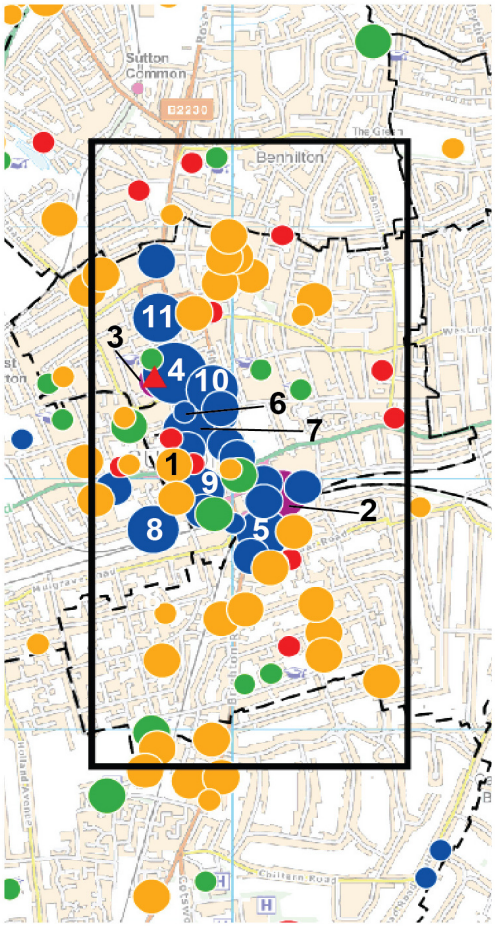
Proposed Developments:

1. Azteque private residential development; and
2. Proposed hotel development in the St Nicholas Shopping Centre.

As identified in the Site Development Policies submission document, and as part of the Implementation Plan (see Chapter 8 Implementation Plan), the Council is seeking to engage with the owners/stakeholders of all of the allocated sites within Sutton Town Centre in order to evaluate their willingness to connect to the DH network. Even though some of these allocated sites may not accommodate development/buildings at a sufficient scale to quality as 'Priority Buildings', it is essential to ensure that all future developments sign up to the DE concept and contribute as necessary/ appropriate to the capital costs of DE infrastructure.

Creating a developers' forum which involved as many of these developers/ owners/ stakeholders as possible would surely be a big step in the right direction.

Figure 6-1: Sutton Town Centre Area of Opportunity



SUTTON TOWN CENTRE AREA OF OPPORTUNITY

LEGEND

1	CIVIC COMPLEX
2	AZTEQUE HOUSE
3	ETAP HOTEL, St NICHOLAS CENTRE
4	St NICHOLAS SHOPPING CENTRE
5	QUANDRANT HOUSE
6	TIMES SQUARE SHOPPING CENTRE
7	St NICHOLAS HOUSE
8	HOMEFIELD PARK RESIDENTIAL DEVELOPMENT
9	MORRISONS
10	MARKS AND SPENCER
11	ASDA SUPERSTORE

Technical

Site appraisal

The St Nicholas Shopping Centre, located in a prominent and central location within this opportunity area, would present a notable opportunity for the deployment of DE as it could reliably serve as an anchor heat load consumer. Additionally, proposals for a three-storey hotel to be built above the existing St Nicholas Shopping Centre are being considered. This would as a steady consumer of heat throughout the year. The proposed development would be heated through by two micro-CHP engines with a combined peak heating output of 25kWth. Therefore, the servicing strategy of the hotel is compatible for connection to a district heating network.

The St Nicholas Shopping Centre is also the third highest heat consuming priority building in the LBS. No information is available regarding the type of heating system used within this retail development. This would need to be further investigated. If the shopping centre is heated by large central boiler plant, it would be necessary to determine their asset replacement cycle and whether opportunity exists to replace these with a CHP, i.e. support the provision of an energy centre.

The distance from the shopping centre to other heat consumers is assessed to determine the appropriate network coverage. Figure 6-1 shows a high concentration of large and diverse heat consumers within a radius of less than 500m. This demonstrates sufficient heat demand and density levels, and the identification of anchor heat load consumers (e.g. St Nicholas Shopping Centre) in support of implementing a district heating network in this area of opportunity.

The Sutton Town Centre area of opportunity includes local government buildings (Civic Complex), several private commercial buildings (Quadrant House and St Nicholas House), shopping precincts (Times Square Shopping Centre) and residential developments (Homefield Park) that could act as heat customers. These act to provide the diversity of loads necessary to balance the demand for heat and increase the feasibility of a DE network.

The Quadrant House is a speculative air conditioned building completed in 1980. Currently, it is occupied by Reed Business Publishing Group and is an office building. According to a Case Study conducted on the Quadrant House[38], the building comprises two linked blocks with 20 and 7 floors, respectively. Two 2.5MW cast iron boilers (fitted with new gas burners in 1987) serve the air handling units and provide domestic hot water and the heat pump water circuit. According to the study, the building consumes around 1,687 MWh/year.

There are a number of housing estates located to the north of the Sutton Town Centre, such as Balaam House and Chaucer House consisting of 60 and 96 units, respectively. The heat demand and density level characteristics of the housing estates, and their ability to act as anchor heat load consumers, could support the technical feasibility of both DE network connection (provided the estates support a central heating system servicing strategy) and energy centre provision (retrofit of existing boiler houses to support CHP installation).

According to information provided by the Council a major residential development is to be located to the south of the Sutton Town Centre. The proposal is to demolish Rafferty House and Sentinel House to make space to two new residential buildings (i.e. the Azteque private residential development), consisting of 13 and 14 storey towers, respectively. The Council confirmed that the completion of this development is estimated around early 2014. The ground floor (1,139m^2) would mainly occupy retail uses, car parking spaces, cycle spaces and associated landscaping and provision of future pedestrian access to Sutton Station. Development proposals indicate that the scheme would be served by a community heating system utilising biomass boiler plant. In particular, the need for the system to be designed and installed to be future proofed for changes in technology has been highlighted as part of the planning application process. Therefore, the proposed energy centre is compatible for connection to a wider community heating system/network and the Council should look to ensure that sufficient plant space is safeguarded for the potential expansion of the system capacity to serve other nearby heat customers.

Although the presence of adequate heat demand and density levels, diversity of demand and anchor load consumers make Sutton Town Centre an ideal location for a district heating network, high land values may mean that generation technologies with a large plant space requirement (e.g. biomass – wood fuel storage) may be constrained. Compact, gas fired CHP solutions would minimise land take-up.

CHP capacity considerations

An in depth energy demand profiling analysis, utilising the baseline BIS metered gas and electricity consumption data (2007), and the forecast energy consumption assessment (2026) associated with the entire Sutton Town Centre area of opportunity, results in the determination of the following CHP capacity:

- Optimum CHP capacity – 4.8MWe.

The predicted annual CO_2 emissions savings associated with the operation of the CHP plant is:

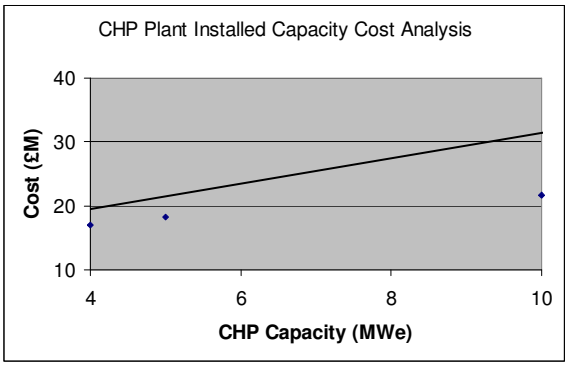
[38] *Good Practice Case Study, Energy Efficiency Office*, Department of Energy, April 1991

- CHP– 8,250 tonnes of CO_2 emissions savings per year.

Strategic
Generally, the area of opportunity and specific sites identified offer a strategic fit at local, regional and national levels.

Financial
Figure 6-2 below demonstrates the trend in cost vs. installed capacity of CHP plant. This relates to the procurement and installation costs of the CHP engine(s) and the energy centre build costs only.

Figure 6-2: CHP Installed Capacity Cost Analysis Graph[39]



Based on *Figure 6-2*, the estimated CHP plant capacity (4.8MWe) indicates installed costs around £22m.

The cost per kilogram of CO_2 saved[40] associated with the CHP is then as follows:

- CHP– £2.66/kgCO_2 saved or £2,666.60/tonne CO_2 saved.

CHP plant will support a district heating network consisting of flow and return pipework with a typical pipework diameter of circa 600mm (including pipework insulation), which equates to a circa 2m^2 cross-sectional area (in terms of trenching requirements) to support distribution. This has significant cost implications with regards to trenching works, particularly where utilities congestion is prevalent.

Economic
The predicted CO_2 emissions savings associated with the implementation of the optimum CHP plant capacities (circa 8.2ktCO_2) indicates circa 18% savings in the CO_2 emissions associated with the application of the optimised CHP plant capacity in the Sutton Town Centre area of opportunity[41].

Deliverability and management
The Council should engage with the private stakeholders to determine their interest for connection to a DE network, as well as to assess the technical feasibility for connection in terms of current servicing strategy and asset/plant replacement cycles.

Additionally, the implications of a mix of a large number of private stakeholders and the Council in terms of establishing ESCo viability would need to be assessed further. Buy in from the private priority building owners, particularly the identified anchor heat load consumers (e.g. St Nicholas Shopping Centre) offers delivery opportunities and minimises delivery risk when considering ESCo viability.

Summary
The specific sites identified within the Sutton Town Centre area of opportunity offer a strategic fit within existing regulatory frameworks for energy and CO_2 emissions mitigation. CO_2 emissions savings in the order of circa 8,200 tonnes per year could be achieved through the implementation of a DE network, contributing to 18% reduction in the area's projected 2015 CO_2 emissions. This supports the national, regional, and local carbon dioxide emissions savings targets.

In addition to establishing an anchor load consumer base, e.g. the St Nicholas Shopping Centre and the proposed hotel concept, these priority buildings offer an opportunity for energy centre provision. No information is available regarding the type of heating system used within this retail development. This would need to be further investigated. If the shopping centre is heated by large central boiler plant, it would be necessary to determine their asset replacement cycle and whether opportunity exists to

[39] Benchmark CHP plant installed cost analysis provided by Cost Consultant, Turner & Townsend.

[40] It should be noted that the cost analysis outlined, based on a £ per kgCO_2 saved, is a simple cost analysis metric. A full Net Present Value (NPV) analysis would be required to offer a more robust cost analysis. This NPV analysis would be undertaken during the proceeding stages of the heat mapping process, i.e. during the DE feasibility and implementation stages.

[41] The percentage CO_2 emissions savings analysis is based on the *London Energy and Greenhouse Gas Emissions Inventory* (*LEGGI*), which provides the carbon dioxide emissions associated with domestic, and commercial and industrial buildings on a 1km by 1km grid basis in Greater London. The most appropriate grid square location is utilised to determine the potential CO_2 emissions savings from the application of the optimised CHP plant capacity within that area, i.e. the Sutton Town Centre, Hackbridge and Rosehill areas.

The *LEGGI* data selected is based on the predicted 2015 CO_2 emissions figures for the Borough. This is the furthest projected CO_2 emissions figures available for the Borough and was selected as it represents the closest values for comparison with respect to the 2026 timeframe.

replace these with a CHP, i.e. support the provision of an energy centre. By installing a CHP within an existing plant space/boiler house that is already available and identified for the relevant use offers practical advantages and can also minimise public perception impacts.

The major residential development to be located to the south of the Sutton Town Centre offers a mix of uses and demonstrates a diversity of consumer types. It offers wider economic impacts as it allows for infrastructure investment. Delivery and management issues risks are minimal as this scheme offers commercial viability and reduced financial risks for prospective ESCos.

The housing estates identified might offer delivery opportunities whilst mitigating delivery risks, as the associated heat demand and level of density significantly improves the commercial viability of an ESCo.

The presence of a high number of different priority buildings in different private ownership is likely to result in a higher delivery risk, requiring commitment from a range of stakeholders. The Council should engage with the private stakeholders to determine their interest for connection to a DE network and gain their buy-in.

The specific sites identified within the Sutton Town Centre area of opportunity offer a strategic fit within existing regulatory frameworks for energy and CO_2 emissions mitigation. CO_2 emissions savings in the order of 8,250 tonnes per year could be achieved through the implementation of a DE network, contributing to a 18% savings in the area's projected 2015 CO_2 emissions. This begins to demonstrate alignment with national, regional and local carbon reduction targets.

The optimum CHP capacity assessed for the Sutton Town Centre area of opportunity offers a robust £/kgCO_2 metric.

Holistically, this area of opportunity is considered to offer a very good fit with the DE implementation objectives, particularly when considering the technical parameters.

Hackbridge Area

Specific sites

The specific sites identified under the Priority Buildings categories are:

Existing Developments:

- Private:
  1. Durand Close residential development (partly private); and
  2. Three existing industrial units in the Felnex Industrial Area.
- Other Public:
  1. Foxglove Way residential development;
  2. Mullards Close residential development;
  3. BedZED residential development;
  4. Corbet Close residential development;
  5. Hackbridge Primary School; and
  6. Culvers House Primary School

Proposed Developments:

1. Felnex Trading Estate;
2. Durand Close regeneration;[42]
3. Corbett Close redevelopment;[43]
4. Wandle Trading Estate; [44]
5. Land Adjacent to Station[45].

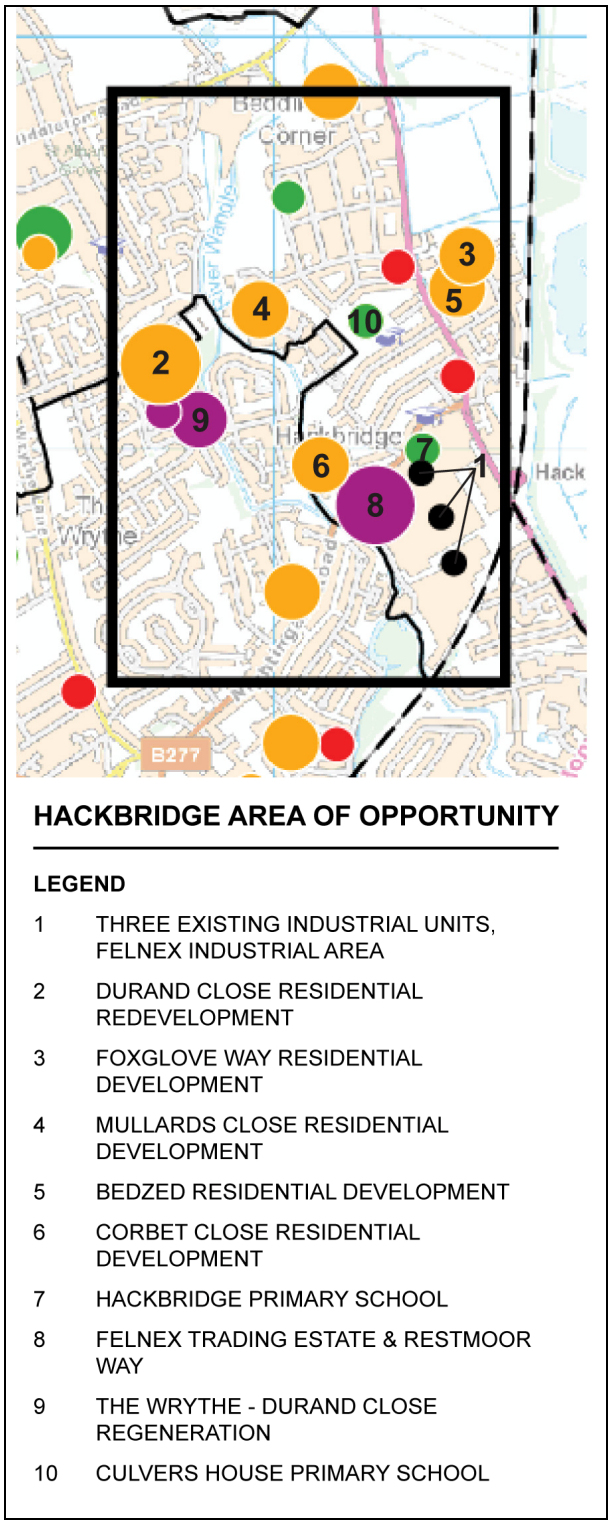
[42] There is one redevelopment underway of Durand Close. This will deliver 431 units by 2016. The Council confirmed that the existing estate is gradually being vacated as progress is made with the rehousing programme. By May this year it is expected that only around 70 residents would still be in occupation and these will be rehoused by the end of next year."

[43] There are 72 existing flats but the Council confirmed that they are looking at the redevelopment of the whole site. Currently, the development viability for 60 units minimum is tested.

[44] This is a 3.2ha site allocation A32 in the Site Development Policies DPD for mixed use, residential and employment and has been also identified in the South London Waste Plan as suitable for waste management facilities – including EfW.

[45] This is a 1.2ha site allocation A23 in the Site Development Policies DPD (mixed use, residential and employment).

Figure 6-3: Hackbridge Area of Opportunity



Technical

Site appraisal

The existing local centre of Hackbridge has been identified as a 'Centre for Growth and Regeneration'[46], involving a comprehensive redevelopment of the wider Hackbridge area to provide a district centre and a sustainable mix of homes, businesses, shops, and community and leisure facilities.

Within the Hackbridge area of opportunity, the established industrial areas such as the Felnex and the Wandle Trading Estates, and the land north of Hackbridge Station all provide opportunities for residential led mixed use development.

The Hackbridge area of opportunity does not exhibit significant existing heat demand due to the industrial land use and low density housing characteristics of the area. However, the Council's aspirations are to retain and improve the industrial buildings (e.g. the Felnex industrial area) and employment opportunities within this area, whilst improving and significantly expanding the housing provision.

The Felnex industrial area is currently occupied by several industrial estates. It is located in very close proximity to two local schools, a railway line and an office/industrial area; comprises older industrial buildings, many of which have become vacant. As mentioned in the *SDP – Preferred Options*, the Felnex Trading Estate is a key site for delivering the strategic objective of regenerating the Hackbridge area. The site itself is underused and the land could be used far more efficiently.

The site is the focus of a current outline planning application that would see its regeneration through the construction of a number of residential led mixed use developments, including offices, retail, and residential (around 700 units) uses. It is expected that the proposed regenerated area would have gas consumption in the order of 5,000MWhr/year.

Although a significant amount of this area will be switching from employment uses to retail and housing uses, the possible loss of job opportunities may be compensated by the more efficient use of land and other employment opportunities arising from the regeneration activities.

The Felnex regeneration hub is in close proximity to proposed residential developments, for example, the Wrythe at Durand Close and Kelvin House.

According to information provided by the Council, the Durand Close development plans consist of more than 400 units. It is estimated that the planned works would be completed by March 2016.

Additionally, the Council confirmed that the outline application proposed the installation of two small CHP units generating 11% of the site's total energy requirements. Pipework trenching space is to be safeguarded to allow for a district heating network to be installed in the future if it becomes cost effective.

Kelvin House is centrally located within the area of opportunity and, under the Hackbridge Masterplan, lies within the core regeneration area of Hackbridge. This site is currently a cleared site having been formerly occupied by a relatively tall office building. It is adjacent to Hackbridge Junior School and the Felnex Trading Estate. The site has gained planning permission for the following mix of uses: retail, offices, and residential (comprising 96 units). The Council confirmed that the development is not planned to be communally heated; however, future proofing has been allowed for through the proposed installation of a sub-station capable of supporting electrical power export from a CHP system, and safeguarded plant space to facilitate future expansion and allow connection to a district heating network.

Hackbridge also hosts the UK's first zero carbon housing development, BedZED. This scheme was completed in 2001. The BedZED development is located to the north west of the Felnex industrial area. Although biomass-CHP plant, fed by locally-produced waste wood, was supposed to deliver the energy requirements of the development; currently most of the electricity is supplied from the national grid with a proportion of renewable electricity being generated on-site by photovoltaic panels. This is due to prototype nature of biomass/CHP technology. BedZED offers a range of opportunities when considering DE implementation: servicing compatibility when considering connection to a district heating network, plant space capacity to support energy centre provision, and storage and supply capabilities when considering biomass.

CHP capacity considerations

The CHP sizing exercise was based on the gas consumption of specific existing and new development sites, such as Wandle Valley Trading Estate; Hackbridge Station and Felnex Trading Estate. This results in the determination of the following optimum CHP capacity:

- Optimum CHP capacity – 750kWe.

The predicted annual CO_2 emissions savings associated with the operation of the CHP plant is:

- CHP– 1,314 tonnes CO_2 emissions savings per year.

Strategic

Generally, the area of opportunity and specific sites identified offer a strategic fit at local, regional and national levels.

[46] *Sutton Local Development Framework*, *Core Planning Strategy*, December 2009

Financial

Based on an indicative CHP cost analysis provided by Cost Consultants, Turner&Townsend[47], the estimated CHP plant capacity (750kWe) indicates installed costs of circa £5m. This relates to the procurement and installation costs of the CHP engine and the energy centre build costs only.

The cost per kilogram of CO_2 saved associated with the CHP is then as follows:

- CHP– £3.81/kgCO_2 saved or £3,806/tonne CO_2 saved.

This conforms to expectations, i.e. economies of scale – the larger capacity CHP in the Sutton Town Centre area of opportunity offers more cost effective carbon dioxide emissions savings than in the Hackbridge Area[48].

Economic

The predicted CO_2 emissions savings associated with the implementation of the optimum CHP plant capacity (circa 1.3ktCO_2) indicate a 8% savings in the Borough's CO_2 emissions. This supports the national, regional, and local carbon dioxide emissions savings targets.

Deliverability and management

The Felnex industrial area has been identified as a fundamental component for establishing an area wide DE network as it represents an opportunity to provide an energy centre on lower value allocated land. The variety of mixed use developments that are proposed within the Felnex industrial area would offer the required heat demand and density levels, and sufficient diversity to support the feasibility of a DE network in the area. The Council is able to direct and shape development proposals so that whilst the regeneration of the area is private led, the delivery risk of DE is reduced. Currently, for example, the Policy DM6 and further guidance in the IPG recommends that the Council seeks seek to negotiate Section 106 agreements with developers as appropriate in applying the DE Protocol in accordance with further detailed guidance to be provided in the Council's forthcoming Planning Obligations SPD.

The Felnex industrial area is also surrounded by several other regeneration developments, mainly residential estates (Kelvin House and Durand Close). It is envisaged that the ownership of these developments will be private; therefore the appetite of the stakeholders to connect to a DE network should be gauged by the Council.

BedZED offers a range of opportunities when considering DE implementation: servicing compatibility when considering connection to a district heating network, plant space capacity to support energy centre provision, and storage and supply capabilities when considering biomass.

Anaerobic Digestion (AD) is being proposed at Viridor's waste handling site, which is situated to the east of the Hackbridge area of opportunity. Although it is anticipated that this waste management facility would only be operational up to 2023, its location is considered to be strategic for the deployment of DE networks in Sutton, particularly within the Hackbridge Area.

The Council should seek to engage with the relevant Waste Authority/licensed waste contractor to identify future opportunities for securing biogas supply and energy from waste facilities on existing/ allocated waste management sites such as Beddington Farmlands in support of zero carbon CHP energy generation in the Hackbridge area.

Additionally, the capital costs associated with putting in the pipework within Hackbridge could be significantly less for Hackbridge than for Sutton Town Centre due to the opportunity afforded by the River Wandle to provide the route for the 'low carbon link'.

Generally, Hackbridge has a large number of viable possibilities for the establishment of an energy centre that would support the implementation of a decentralised energy network. However, due to the consensus required by a large range of private stakeholders to consider DE connection/implementation in the context of delivering regeneration opportunities, the delivery risk may become evident as development progresses. The Council should seek to gain buy-in form these stakeholders as part of the planning application process.

Summary

Generally the Hackbridge area of opportunity and the specific sites identified offer significant delivery opportunities, although delivery risks would have to be managed carefully.

The specific sites identified within the Hackbridge area of opportunity offer a strategic fit within existing regulatory frameworks for energy and CO_2 emissions mitigation. CO_2 emissions savings in the order of 1,300 tonnes per year could be achieved through the implementation of a DE network, contributing to an 8% savings in the area's projected 2015 CO_2 emissions.

[47] URS, *City of London Decentralised Energy and Pipe Subways Study Baseline Report*, December 2009

[48] However, it should be noted that the CHP capacities indicated in the shortlisted areas of opportunity still demonstrate cost effectiveness, i.e. appear to offer a robust £ per kgCO_2 emissions saved metric. A detailed NPV analysis is required to fully assess the financial viability of any DE system proposals. This NPV analysis would be undertaken during the proceeding stages of the heat mapping process, during the DE feasibility and implementation stages.

The optimum CHP capacity assessed for the Sutton Town Centre area of opportunity offers a robust £/kgCO_2 metric.

Holistically, this area of opportunity is considered to offer a very good fit with the DE implementation objectives, particularly when considering the technical, and delivery and management parameters.

Rosehill Area

Specific sites

The specific sites identified under the Priority Buildings categories are:

Existing Developments:

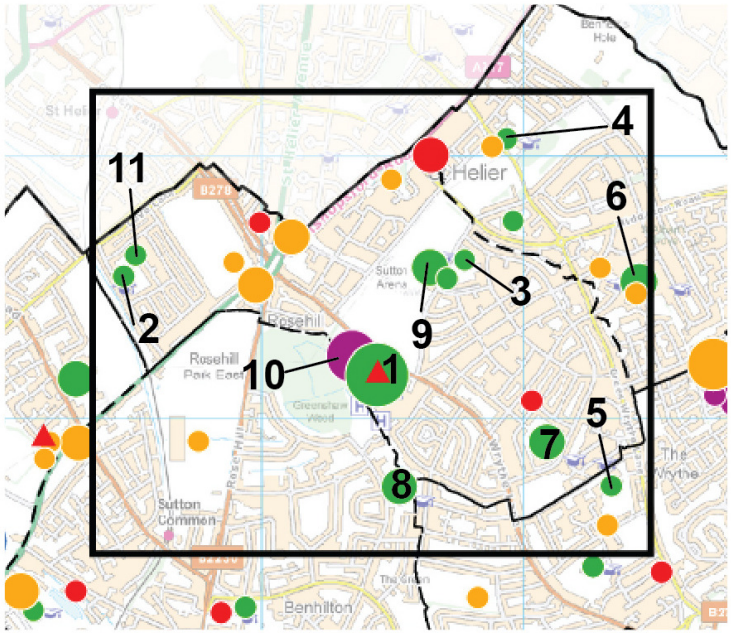
- Other Public:
  1. St Helier Hospital;
  2. Abbey Primary School;
  3. Tweedale Primary School;
  4. Green Wrythe Primary School;
  5. Muschamp Primary School;
  6. Wandle Valley Secondary School;
  7. Carshalton Boys Sports College;
  8. Greenshaw High School;
  9. Glastonbury Training Centre[49]; and
  10. The Sutton Arena Leisure Centre.

Proposed Development

1. St Helier Hospital – new building.

[49] Site C1 in Site Development Policies document

Figure 6-4: Rosehill Area of Opportunity



ROSEHILL AREA OF OPPORTUNITY

LEGEND

1	ST HELIER HOSPITAL
2	ABBEY SCHOOL PRIMARY SCHOOL
3	TWEEDALE PRIMARY SCHOOL
4	GREEN WRYTHE PRIMARY SCHOOL
5	MUSCHAMP PRIMARY SCHOOL
6	WANDLE VALLEY SECONDARY SCHOOL
7	CARSHALTON BOYS SPORTS SECONDARY SCHOOLS
8	GREENSHAW HIGH SCHOOL
9	THE SUTTON ARENA LEISURE CENTRE
10	ST HELIER HOSPITAL (new building)
11	GLASTONBURY TRAINING CENTRE

Technical

Site appraisal

This area of opportunity includes one of the major heat consumers within the Borough, i.e. St Helier Hospital. At the beginning of 2010, the plans to redevelop and expand the hospital were awarded outline planning permission. These plans include replacing large parts of the existing hospital and constructing a new building in close proximity to the existing building. A Combined Cooling Heat and Power (CCHP) scheme operating on biofuel is proposed.

The current CCHP proposal is to serve the new building only; however, this might be installed within existing, retrofitted plant space that is already available within the existing building. This would offer practical advantages and minimises any public perception impacts.

It should be highlighted that the Rosehill area of opportunity also contains a fair amount of primary and secondary schools, which surround the St Helier Hospital, ranging in proximity from circa 400m – 1km. The Sutton Arena Leisure Centre is also located within this cluster of educational centres that focus around on the St Helier Hospital. When considering the technical constraints with regards to appropriate network coverage (3km radius), the potential for developing a DE network with an energy centre anchored at St Helier Hospital appears to offer technical feasibility.

This area has the potential to technically validate the application of a DE network as follows: St Helier Hospital and the Sutton Arena Leisure Centre acting as anchor heat load consumers, St Helier Hospital anchoring an energy centre, and the educational centres providing a sufficient diversity of consumer types. This would improve the commercial viability of an ESCo operating in the area of opportunity.

CHP capacity considerations

The CHP sizing exercise was based on the gas consumption of the hospital, leisure centre and schools within the area. This results in the determination of the following optimum CHP capacity:

- Optimum CHP capacity – 1.29MWe, and

The predicted annual CO_2 emissions savings associated with the operation of the CHP plant is:

- CHP– 2,765 tonnes CO_2 emissions savings per year.

Strategic

Generally, the area of opportunity and specific sites identified offer a strategic fit at local, regional and national levels.

Financial

Based on an indicative CHP cost analysis provided by Cost Consultants, Turner&Townsend[50], the estimated CHP plant capacity (1.29MWe) indicates installed costs of circa £7m. This relates to the procurement and installation costs of the CHP engine and the energy centre build costs only.

The cost per kilogram of CO_2 saved associated with the CHP is then as follows:

- CHP– £2.53/kgCO_2 saved or £2,531.6/tonne CO_2 saved.

Economic

The predicted CO_2 emissions savings associated with the implementation of the optimum CHP plant capacity (circa 2.8ktCO_2) indicates a 14% savings in the Borough's CO_2 emissions associated with the application of the optimised CHP plant capacity in the Rosehill area of opportunity. This supports the national, regional, and local carbon dioxide emissions savings targets.

Deliverability and management

The identified priority buildings within this opportunity area are mainly public/government buildings. This is likely to result in reduced levels of delivery risk, as a commitment from a limited range of stakeholders (the relevant NHS Trust and the Council) to consider DE connection/implementation in the context of delivering opportunities can be more easily achieved.

Summary

St Helier Hospital and the Sutton Arena Leisure Centre acting as anchor heat load consumers, St Helier Hospital anchoring an energy centre, and the educational centres providing a sufficient diversity of consumer types meet the technical criteria for DE implementation and improve the commercial viability of an ESCo operating in this area of opportunity.

A limited range of stakeholders minimises delivery risk as the Council will be able to gain buy-in more readily.

The specific sites identified within the Rosehill area of opportunity offer a strategic fit within existing regulatory frameworks for energy and CO_2 emissions mitigation. CO_2 emissions savings in the order of 3,000 tonnes per year could be achieved through the implementation of a DE network, contributing to a 14% reduction in the opportunity area CO_2 emissions. This demonstrates alignment with national, regional and local carbon reduction targets.

The optimum CHP capacity assessed still offers a robust £/kgCO_2 metric when considering economies of scale.

[50] URS, *City of London Decentralised Energy and Pipe Subways Study Baseline Report*, December 2009

Holistically, this area of opportunity is considered to offer a very good fit with the DE implementation objectives, particularly when considering the technical, and delivery and management parameters.

6.3. Intra-Borough Linkages

Figure 6-5 Intra-Borough Connectivity illustrates the indicative intra-borough connectivity when considering the spatial implementation of decentralised energy for the identified areas of opportunity.

Based on the evaluation of the shortlisted areas of opportunity, the concentration of demand and density, diversity and anchor loads, and other framework factors, such as delivery and management, financial, etc, it has been demonstrated that Sutton Town Centre (technically led), the Hackbridge area (technically and delivery led), and Rosehill area (technically and delivery led) offer the highest potential for decentralised energy development/implementation.

Within each area of opportunity, areas of site opportunity are further illustrated based on the site appraisal. The areas of site opportunity display a good performance against the framework criteria (see Section 6.1).

In terms of phasing, the deployment of DE in the identified areas of opportunity could originally be established based on single site schemes, with energy centres located in existing plant/boiler rooms or accommodated in the plant room of proposed developments, and where anchor load consumers could guarantee a baseload demand.

Within the Sutton Town Centre area of opportunity, the St Nicholas Shopping Centre could serve as an energy centre location (compatible for connection to a wider district heating network). Safeguarding of plant space for the potential expansion of the energy centre to serve other nearby heat customers would allow for future proofing of expansion capabilities. Latter phases of DE implementation could then consider the neighbouring private commercial buildings (Quadrant House and St Nicholas House), shopping precincts (Times Square Shopping Centre) and residential developments (Homefield Park) that could act as heat customers. These act to provide the diversity of loads necessary to balance the demand for heat and increase the feasibility of a DE network.

Phasing for the Hackbridge area of opportunity is likely to be driven by planned regeneration. The large landowners in this area offer the best delivery opportunities for energy centre provision due to the subsequent development of large heat customers, which could act as anchor heat load consumers, and sufficient levels of density and mix of uses to support the commercial viability of an ESCo operating in the area. However, it should be noted that these developments would be mainly privately owned, therefore the stakeholders would have to be guided by the Council through the planning application process to deliver the DE vision for the area.

The location of Hackbridge is also strategically important and supports the correct feasibility of an intra-borough wide decentralised energy network. Hackbridge indeed is located close to an existing energy centre (i.e. CHP unit in the Westcroft Leisure Centre) and to a potential EfW facility on the Wandle estate site and at the Viridor site.

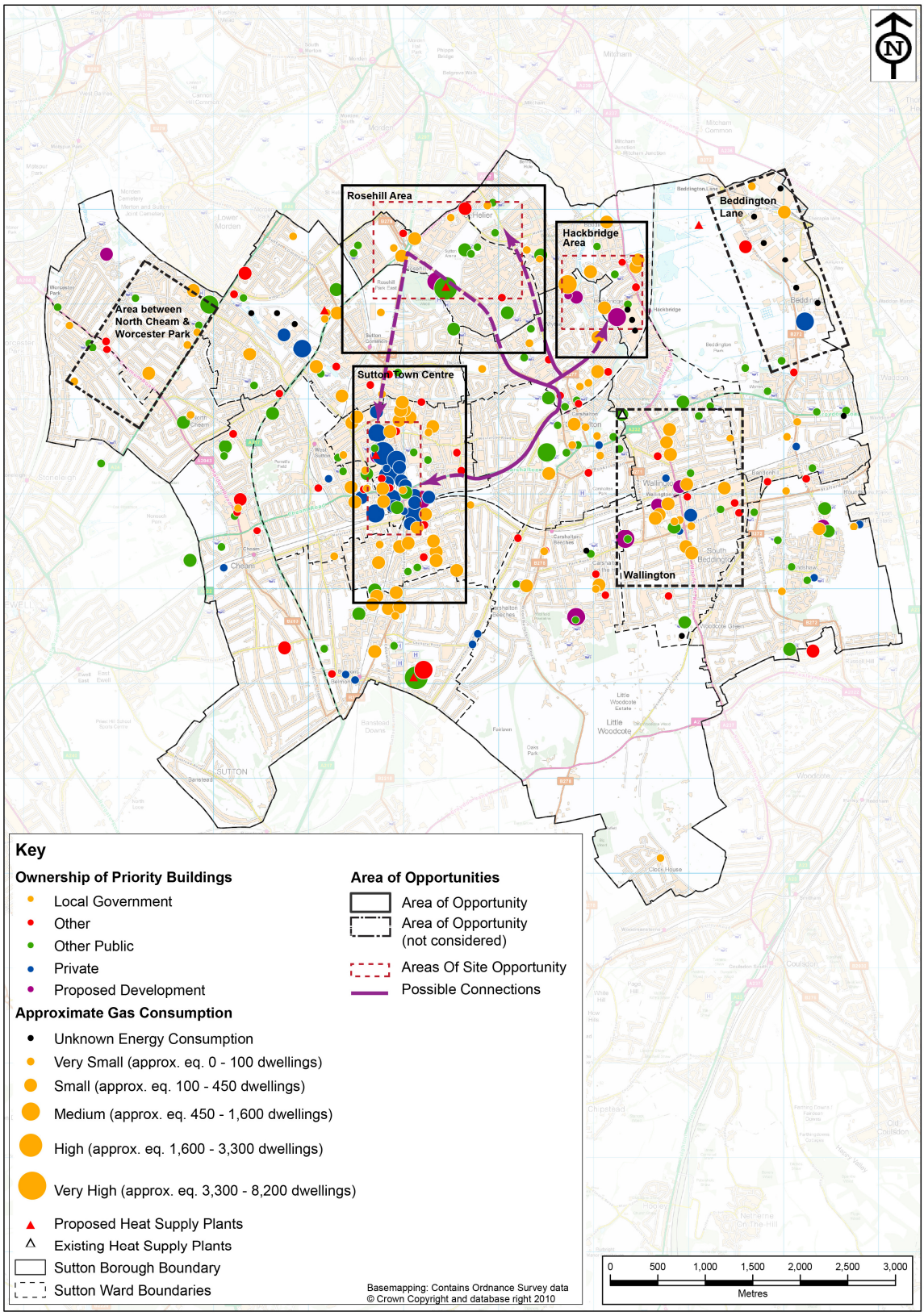
Within the Rosehill area of opportunity, St Helier Hospital offers a first phase delivery option for energy centre provision as part of their development proposals. Latter phases of DE delivery would see St Helier Hospital and the Sutton Arena Leisure Centre acting as anchor heat load consumers. The intent would then be to catalyse the connection the educational centres, which provide a sufficient diversity of consumer types, as asset replacement programmes are implemented for these buildings and funds become available.

Initial or first phase DE delivery is typically driven by the identification of suitable energy centre locations that can readily overcome environmental constraints. In the latter phases of DE network development, network expansion and connection would organically evolve to include multi-site mixed use schemes through a number of existing single-site schemes and neighbouring heat consumers to support the commercial viability of an expanded network. The timing for the connection of single-site schemes and heat consumers would be partly driven by the asset replacement cycles of existing building stock. Any major new developments within the areas of opportunity could also be compelled to connect into the network once it is in place or future proofed for connection to support network expansion at a later date. Therefore, alignment of planning policy would be a key consideration at this stage of the heat mapping process.

Over time, a large-scale network could develop that connects the areas of opportunity though the intra-connection of general multi-site schemes and the consolidation of energy production into fewer, larger, more efficient energy centres. Existing and proposed heat supply plants could offer the basis for intra-connection, acting as connection nodes between the areas of site opportunity. Likely network routes should also be established and safeguarded.

As discussed in more detail in Chapter 7, limitations associated with the deployment of a heat network in the Borough are considered for immediate next steps to assess the feasibility of this overall spatial DE delivery scenario.

Figure 6-5: Intra-Borough Connectivity



6.4. Cross-Borough Linkages

Based on the identification of the shortlisted areas of opportunity for DE in the Royal Borough of Kingston upon Thames (RBK)[51] (determined through their heat mapping study), an evaluation of opportunities for DE linkages among the boroughs is presented in this section.

Cross-borough linkages can increase the viability of certain DE proposals, for example, by boosting the concentration of head demand and density levels, and offering a greater number of anchor load consumers that are in close proximity to the identified areas of opportunity in the LBS, even if not within the Borough boundary.

The RBK *Heat Mapping Study* identified one major area where potential exists for the deployment of DE, i.e. Kingston Town Centre with support from the activities planned in the Hogsmill Valley area.

Hogsmill Valley is a key area, which, according to the *Kingston Core Strategy*, the Council is seeking to evaluate and establish as part of a low carbon decentralised energy network. In particular, the Hogsmill Sewage Treatment Works is considered a strategic location for the deployment of DE opportunities in the Borough with potential to capture any waste heat associated with the sewage treatment plant and utilise it to provide heat to surrounding properties that will form part of a district heating network. Proposed developments that fall within this area could also be required to connect to the potential network, increasing the viability of the scheme.

The deployment of a DE network within this area would also take advantage of the Council-owned waste site at Villiers Road that has been identified as a potential area for redevelopment as a waste facility. Opportunities for EfW facilities could therefore be investigated within the context of DE. The Villiers Road Site has also been identified with the *South London Waste Plan, Potential Sites and Policies*[52] as Site Number 6 and has been characterised as having potential for redevelopment with no identified constraints.

Tolworth is also a regeneration area, where the Council will promote social and economic development and environmental enhancement over the next ten years, as indicated in the *Tolworth Project Draft Strategy*[53]. According to local policy documents and discussions with the Kingston planning officers, major development proposals are expected to materialise in this area.

These areas of Kingston are located close to the area of Worcester Park and North Cheam in Sutton. As discussed in Chapter 5, these areas were not shortlisted for more detailed DE delivery assessment due to limited technical opportunities. This was mainly due to the lack of appropriate priority buildings within Worcester Park and North Cheam that could provide a high and steady heat demand. Additionally, the Council confirmed that significant growth is not expected in this area in the medium to long term. The area is currently occupied by residential developments and industrial/commercial developments, and their heat demand is limited. According to the *Sutton Core Strategy*, the development and intensification of Kimpton industrial area, located between Worcester Park and North Cheam, is encouraged as a strategic industrial location. The public buildings located in this area include some schools and a community centre, but the heat demand associated with these is not large enough to support anchor load consumer provision.

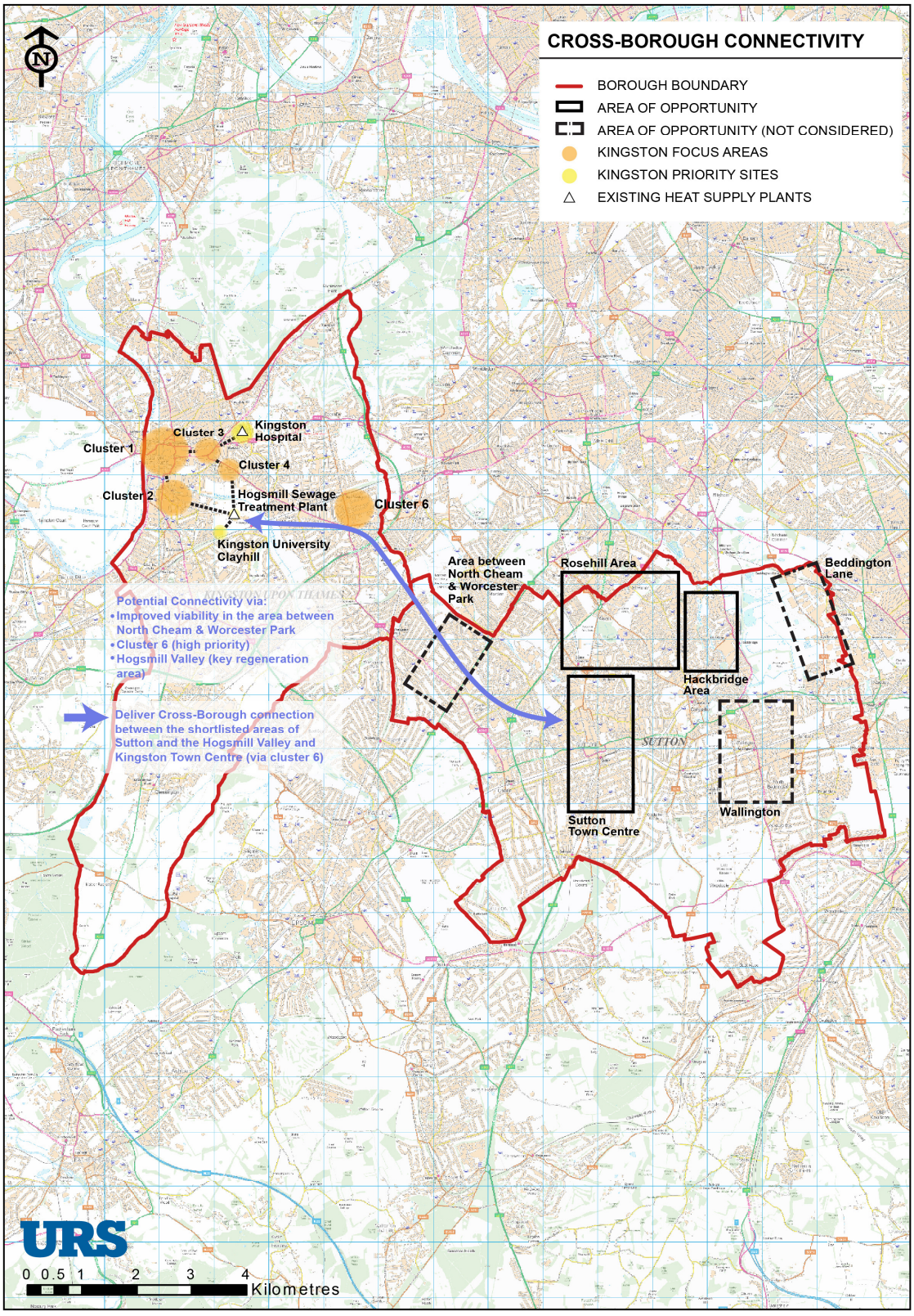
Although the distance between Hogsmill Valley (and Kingston Town Centre)/Tolworth and Worcester Park/North Cheam is significant, potential linkages could be established between the two areas through connection of proposed and existing developments. However, as the proposed developments in the LBS and RBK consist predominantly of future development areas it is foreseen that there would be limited opportunity to act in the short to medium term. It is likely that these opportunities could develop within the 2026-2050 DE timeframe.

51 Royal Borough of Kingston upon Thames, *Heat Mapping Study*, *Final Report*, URS June 2010,

52 *South London Waste Plan*, *Potential Sites and Policies*, *Consultation Policies*, *20th July to 16th October 2009*

53 *Tolworth Project*, *Draft Strategy*, November 2009

Figure 6-6: Cross-Borough Connectivity



7. NEXT STEPS

According to the LDA and the *DEMaP Support Package to Boroughs*, there are three phases towards the implementation of decentralised energy opportunities:

- Capacity building;
- Feasibility and delivery route; and
- Project definition and delivery.

Phase 1, characterised by the LDA as the 'Capacity building' stage, includes the following sub-stages:

- Heat mapping;
- Political support and commitment;
- Strategies and policies; and
- Budget commitment.

The LBS are currently undertaking the first stage of Phase 1, Heat mapping. The remainder of this chapter focuses on key recommendations on how the Council could follow up on the heat mapping work undertaken as part of this Study in order to complete Phase 1.

7.1. The Route to the Feasibility Studies Stage

The high level findings outlined in this report identify a number of opportunities and benefits for developing a decentralised energy network in the LBS. After completing the 'Capacity building' stage through the steps identified in this chapter, the Study could continue to conduct a more detailed assessment of the technical, financial and legal feasibility, such as identifying infrastructure routes and constraints, testing operational scenarios and CHP sizes, and identifying anchor heat load consumers. The key issues to be examined at the feasibility stage would be:

- Test a number of operational scenarios and CHP sizes for different clusters and identify core clusters/schemes;
- Identify anchor heat load consumers for core clusters/schemes;
- Intensify engagement with key stakeholders to explain possible contractual routes to implementation and gauge appetite towards risk;
- Identify possible locations for DE plant to serve the core clusters/schemes;
- Identify infrastructure routes and constraints (for example check existing services in buildings for engineering compatibility and space, identify routes for pipework including existing tunnels, basements, etc.);
- Estimate thermal baseload and phasing of load growth to develop an annual load duration curve and determine the likely scale of CHP plant;
- Produce drawings/sketches showing buildings, plant locations and distribution infrastructure;
- Summarise CO_2 savings;
- Prepare a detailed recommendation for preferred technical options;
- Estimate capital cost, energy sales, operating costs and any funding gap; and
- Consider implementation and procurement.

Therefore, a set of feasibility studies would be needed to evaluate the feasibility of a comprehensive decentralised energy network to serve the needs of the LBS.

Building on the strategic criteria adopted in Section 6.1, the following considerations should be noted when furthering the work towards the implementation of DE networks in the Borough:

Technical and Environmental Considerations

Technical limitations that should be considered include the following:

- Identifying appropriate energy centre locations;
- Ensuring that the gas and electricity grids are able to support the delivery of DE schemes;
- Assessing the existing utility infrastructure provision to inform the energy centre location and capacity, and potential building intra-connections; and
- Assessing the existing building infrastructure and existing heating systems, and the potential for retrofitting.

In respect to the existing utility infrastructure provision, its rated capacities must be considered before determining the technical constraints on the energy centre location and capacity. These parameters can be determined through statutory searches. Constraints that need to be considered in the potential use of existing infrastructure are:

- There appears to be a lack of a centrally compiled database of existing infrastructure, including location, status, ownership, capacity and condition. This makes assessment of the potential to use existing infrastructure difficult and also creates problems ensuring that new infrastructure is not obstructed by existing infrastructure;
- Utilities companies are generally reluctant to share spare space in their existing infrastructure. There is often a lack of awareness that there are

acceptable design and management solutions to sharing, e.g. tunnel space; and

- Creating relevant pipe infrastructure is likely to cross many land ownerships and requires relevant statutory powers. It is therefore essential that either the public sector uses its relevant compulsory purchase powers and/or it is partnered with a utility provider with relevant powers.

Therefore, compiling better information on existing utilities and existing networks and plans for capital improvements and expansion is a key step towards assessing the feasibility of DE networks in the LBS.

With regards to specific environmental constraints, potentially acceptable solutions include the use of emissions abatement technologies, sound insulation and increased chimney heights to help disperse pollutants. Single, large scale energy centre schemes lend themselves better at mitigating air quality issues as abatement technologies are generally only financially viable at large scale capacities.

A range of potential energy centre technologies and scales should be considered, with the aim of mitigating any impacts to an acceptable level. Consideration should be given to technologies with lower environmental impacts, such as gas fired CHP/CCHP plant.

Sensitive, well thought through stakeholder engagement and consultation can help gain buy in and bring about behavioural change that will support acceptance of why a shift is required in the way energy is supplied and the acceptability of proposed energy centres.

Financial Considerations

In terms of financial constraints, a barrier to DE delivery is the significant capital expenditure outlay and associated risk to put in place the necessary distribution infrastructure. Such investment is deemed a high risk option by most companies and investors. One way to de-risk the investment and provide more revenue forecast certainty is the identification and securing of core/anchor heat load consumers.

Smaller scale systems tend to have lower efficiencies, while the relative transaction costs to establish them may be higher. This is due to the fact that development costs associated with establishing a DE network are similar when a certain scale has been reached (MW capacity range). Any investment requires initial feasibility work and these costs do not vary significantly with the project size. In contrast, larger scale projects may be able to offer economies of scale and increased efficiency, including improved costs per tonne of carbon dioxide emissions saved.

Deliverability and Management Considerations

In order to gain a comprehensive understanding of the management implications of any proposed DE network, the following will need to be explored with the client stakeholder group and beyond:

- What value each stakeholder attributes to participating in delivery of a DE network?
- What value each sees in potentially having access to a heat network?
- What potential value each sees in participating in delivery of heat generation, distribution or supply?
- What demand for energy centres or infrastructure or heat could they commit to, along which distribution routes or in which location, if the terms were right?
- What price range would make schemes attractive? and
- What resource (financial, technical, land, other) could they offer, if the terms were right?

A preliminary indication of interest has been gauged by means of a stakeholder consultation exercise that the Council has started as part of this heat mapping exercise.

More detailed responses to questions listed above should be assessed against each of the opportunity areas considered in this report.

7.2. Political Support and Commitment

The process of developing DE projects is a major undertaking requiring clear political commitment and leadership, and significant allocation of up-front and on-going resources. The support of senior, influential decision makers is fundamental to progressing the DE opportunities into the next stage, as is the commitment from the relevant Council departments/teams. Therefore, the Council should consider how it can help facilitate (and initiate) projects, and whether it can source and provide reasonably significant resources for up-front feasibility and project development work.

In gaining support, the Council can utilise the opportunity represented by the increasing interest in climate change and resource management issues, which has generated an increased focus on energy management and carbon dioxide emissions savings. The opportunities regarding installation of community infrastructure (in both new and existing developments) in the LBS may offer significant reductions in CO_2 emissions and support energy security.

To reinforce the role of the Council, the LBS could consider identifying/creating a central 'Borough

Champion' with responsibility for an intra- and cross-borough strategy for decentralised energy delivery. The 'Borough Champion' could be responsible for tasks such as:

- Clearly articulating the contribution decentralised energy generation and heat networks can make to meeting the Borough's CO_2 emissions savings targets;
- Overcoming barriers to the roll out of decentralised energy and heat networks;
- Supporting necessary changes/adjustments to ensure an effective planning system is in place;
- Engaging relevant stakeholders through workshops and forums;
- Encouraging members of the Local Strategic Partnership, housing associations and other public sector partners (schools, hospitals, leisure centres, etc.) to consider DE options;
- Supporting targeted awareness raising campaigns (i.e. to drive behavioural change), information and demonstrations to help build confidence and address organisational barriers; and
- Working with other responsible bodies to ensure the integrated delivery of community infrastructure.

Stakeholder engagement should be one of the key actions to be undertaken by the 'Borough Champion'. This will help gain buy in and bring about behavioural change that will support the deployment of DE networks.

The key stakeholders identified by this Study are presented in *Table 7-1*. The consultation should be designed to assess the potential stakeholders understanding of the benefits provided by the deployment of DE networks. A preliminary questionnaire could help identify the key issues to be discussed during workshops with stakeholders, as one of the immediate next steps.

The consultation process should also aim to supplement data collected through this Study. For example, private sector buildings should be encouraged to publish their energy consumption information, e.g. when their next boiler refit/major refurbishment is due or when their energy supply contract is next up for renewal. This information could be added on the DEMaP Database to enhance the accuracy of the heat loads, especially in cases where benchmarks were used.

At later stages of the DE programme, the 'Borough Champion' would mature to a DE Committee, to assume responsibilities, such as:

- Managing the procurement process;
- Using relevant powers to secure sites, access and, possibly to some degree, regulation of infrastructure; and
- Committing to changing estate management processes and investment cycles to link in their own property assets as anchor heat load consumers for DE networks. There may also be a need to commit the local authorities own resources.

Table 7-1: List of Potential Stakeholders

St Helier Hospital
Felnex Trading Estate
St Nicholas Shopping Centre
Times Square Shopping Centre
Morrisons
Marks & Spencer
Asda Superstores
Viridor
Energy Partners (ESCos)
RSLs
Others

7.3. Strategies and Policies

In order to secure investment, the Council will need to use its planning powers to ensure that consumers connect to heating networks. Developers should be required to incorporate CHP and communal heating on a site specific basis, and ensure that building services are designed to connect to wider networks in the future (future proofing).

Therefore, alignment of planning policy is a key consideration at this stage of the heat mapping process.

Specifically, Policy DM6 of the emerging Site development Policies DPD and the Council's draft Interim planning guidance (IPG) on 'Climate Change Mitigation' already provide extensive policy guidance aimed at ensuring that developments create or connect to DE networks.

Policy DM6 and further guidance in the IPG require that:

(i) *Where the proposed development is adjacent to an existing DE network, it should:*
- *secure the direct connection of all units to that network; and*
- *contribute as necessary to the increased capacity of the DE network to support such connection.*

(ii) *Where there is an existing DE network that requires extension in order to supply the proposed development, proposed developments should:*
- *contribute to such extension;*

- *secure the direct connection of all units to the extended network; and*
- *contribute as necessary to the increased capacity of the DE network to support such connection.*

(iii) *Where there is a planned DE network within feasible and viable range of future connection and/or within identified DE Opportunity Areas, proposed developments should:*

- *commit to connect to any future DE network provided that (i) the reliability of the system has been demonstrated continuously over a period of 6 months, and (ii) the costs in sourcing heating and hot water by the residential and non-residential units will not materially increase;*
- *incorporate site-wide and/or communal heating systems, and not include in-unit boilers or electrical heating systems, where a future connection to the planned DE network is viable;*
- *ensure that the proposed site-wide and/or communal heating systems are equipped to connect any future DE network with minimum need for retrofit;*
- *provide sufficient space within the energy centre or plant room to accommodate additional future heat generation capacity to supply DE connection equipment such as pipes, heat exchangers and pumps etc*
- *locate the energy centre or plant room to ensure the shortest connection distance to the future network, having regard to the requirements of the network as a whole;*
- *use the layout, density and mix of development to support identified DE opportunities;*
- *provide pipe connections as appropriate to the site boundary or safeguard an identified route within the site for future DE connection infrastructure; and*
- *where the planned DE network requires extension to supply the proposed development, proposed developments should contribute to such extension.*

(iv) *Where there is no existing or planned DE network within feasible or viable range of future connection, proposed developments should incorporate site-wide and/or communal heating and cooling systems to serve the development where feasible and viable, and not include in-unit boilers or electrical heating systems. Such heating and cooling systems must be designed to run efficiently and be optimally sized to maximise carbon dioxide savings.*

The Council will seek to negotiate Section 106 agreements with developers as appropriate in applying the DE Protocol in accordance with further detailed guidance to be provided in the Council's forthcoming Planning Obligations SPD.

As indicated in the Section 6.1, public sector or local authority buildings provide excellent anchor heat load potential. These buildings should be encouraged to connect to planned heating networks at the next available opportunity, i.e. at time of boiler replacement or when energy supply contract comes up for renewal.

A requirement for public sector buildings to join a local heat network when one is available would deliver potential anchor heat load consumers and, therefore, reduce financial risk. Consideration should also be given to planned networks when determining the location of new public sector buildings.

7.3.1. Budget Commitment

During this stage, the Council would need to explore available funding streams to help secure a budget to carry out options appraisal for DE projects and develop an implementation programme.

Given the caveats on the cost and viability of energy planning requirements, a local authority's position can be strengthened if there is an Energy Services Company (ESCo) partner to invest in the infrastructure, offsetting the capital costs and mitigating the risk for developers.

7.3.2. Energy Services Companies (ESCos)

A variety of different community-owned, privately financed or public-private partnership delivery structures have been developed to finance decentralised energy systems. These structures are generically termed Energy Services Companies (ESCos). ESCos usually install, finance and manage community energy systems and, therefore, provide an efficient and comparatively lower risk approach to district heating network installation and management.

ESCo providers can consist of large scale utility providers such as E.ON, and other specialist ESCo providers such as Dalkia Utilities (Pimlico District Heating Undertaking), and Thameswey Energy Limited (Woking town centre district heating/cooling networks and private wire scheme). Table 7-2 presents a list of ESCos currently operating in London.

Table 7-2: ESCos operating in London

1. Cofely

2. E.ON
3. Dalkia
4. Inexus
5. SSE Utility Solutions

Successful community energy projects require high level support from local authorities to help promote the project with planners, developers, communities and utility providers. Critically, the Council would need to act as either a partner or a key customer (by utilising public sector buildings to provide guaranteed custom) for ESCos.

The term ESCo refers to a wide range of different energy supply arrangements. Essentially, an ESCo acts like a utility provider but instead of supplying gas, heat is supplied. Typically, in order for an ESCo to be viable, the tariff structure for heat supply must meet or better that for gas supply, i.e. the unit price for heat is equivalent or better than the unit price for gas. Currently, the supply of heat is not regulated, unlike gas and electricity, therefore the local authority is tasked to ensure that any ESCo provider can offer full security of supply at equivalent costs to that of the conventional grid.

Another aspect of a CHP/CCHP network is the supply of electricity to customers through a private wire scheme (i.e. unconnected to the national grid). This is very attractive to ESCos as the tariff structure improves the financial viability of decentralised energy systems. Similarly, the local authority is tasked to ensure that any ESCo provider can offer full security of supply at equivalent costs to that of the conventional grid.

Businesses and homes (public and private) connected to district heating/cooling networks and private wire schemes would experience no significant operational differences than if connected to conventional utility providers. The same security of supply would apply, meaning that the customer would not need to provide on site plant to back-up a loss of heat or electricity supply. The ESCo would be required to provide back-up and top-up boiler plant as part of the energy centre plant provision, ensuring that should the CHP plant fail or be subject to operational downtime for preventative and reactive maintenance, the heat supply would not be affected. Similarly, as is the case of the Woking town centre private wire scheme, a third party connection would be need to be established with EDF[54] such that full electricity back-up is always available. This also ensures that the customer can maintain their right to switch electricity suppliers in line with EU competition regulations. This also motivates ESCos to maintain competitive tariffs.

In addition to the energy supply, an ESCo may provide finance for the provision of end services (heat, power and comfort), the expertise to maintain the equipment, and advise residents/occupants in the correct operation of equipment and appliances.

7.3.3. ESCos Procurement

The majority of existing local authority CHP schemes have been developed in partnership with an ESCo. An ESCo can be created by the Council on its own or it can be created as a joint venture with a private sector partner. As described above, an ESCo would typically provide capital finance, project design, construction, management, fuel purchasing, plant operation, maintenance, and long term replacement and risk management. The Council would have a contract with the ESCo for the supply of heat and power.

There are a number of different routes to procurement of an ESCo partner and it is generally recommended that selection and involvement of suitable partners takes place as early on in the development process as possible. As indicated in the *Community Energy: Urban Planning for a Low Carbon Future*[55], procurement routes could include:

- Identification of a private ESCo partner: selection of a specialist CHP provider through a tender process and based on competitive dialogue; and
- Establishment of a new standalone ESCo: the establishment of a special purpose vehicle with a standalone business plan. Options could include:
    - Public/ private partnership: local authority partnership with a private sector CHP partner; and
    - Social enterprise: new enterprise established with local authority support (to provide covenant strength) and board representation.

A report by the London Energy Partnership[56] has highlighted the role that local authorities can play in helping to establish ESCos, their powers to facilitate new infrastructure and the legal scope of their ability to participate in new ventures.

[54] As owner of the National Grid, EDF would be the utility provider responsible for negotiating a third party connection to a private wire scheme. However, electricity customers are still able to select any electricity supplier as EDF is acting only as the infrastructure provider and not necessarily the electricity supplier.

[55] TCPA & CHPA, *Community Energy: Urban Planning for a Low Carbon Future*, 2008

[56] London Energy Partnership, *Making ESCOs work – Guidance and advice on setting up and delivering an ESCO,* February 2007

The Danish consumer-owned ESCo model could be particularly relevant to the UK situation, addressing as it does many of the concerns raised by developers and energy consumers such as accountability for a monopoly supply. This model could be established as a social enterprise with local authority support, potentially using Community Interest Company or Industrial & Provident Society legal structures.

In order to make progress, a step change is needed not just in strategic policy and planning, but in the scale of investment being made. Local authorities are significant purchasers of energy services in their local areas. They have the ability to act as a catalyst for energy projects, with the potential for their portfolio of buildings to provide baseloads and long term supply contracts as anchor heat load consumers for community energy projects.

Table 7.3: Summary of DE Deployment Implementation Stages

Phase 1 Capacity Building		
Heat Mapping	**Political Support and Commitment**	**Strategies and Policies**
o Identify key 'anchor' heat loads (existing and proposed) o Identify existing and proposed heat networks o Gather energy consumption, energy supply assets and associated data from local stakeholders/building owners/borough officers o Define boundary of DE project/opportunity area	o Gain the support and commitment of senior, influential decision makers to progressing the DE opportunities further Secure DE in strategy documents	o Identify all relevant strategies that can be utilised to facilitate the implementation of DE in the borough and ensure that all policies are worded accordingly (e.g. waste, housing, energy, planning, LDF Core Strategy, OAPF, AAP, LAA, SPG, etc)
Phase 2 **Feasibility and Delivery Route**		
Feasibility Study	**Delivery Route / Procurement Strategy Options**	
o Identify infrastructure routes and constraints o Test a number of operational scenarios and CHP sizes for different clusters o Identify 'catalyst' consumers for core cluster/scheme o Engage key stakeholders to explain possible contractual routes to implementation and gauge appetite towards risk o Identify lead organisation(s) to pull together group of like minded parties with heat loads to pledge o Drawings showing buildings, plant locations and distribution infrastructure o Summary CO2 savings o Detailed recommendation for preferred technical option	o Develop capital and operating costs and revenues for different options and run whole life cost model o Identify preferred scheme(s) to take forward based on agreed metric e.g. £/tCO2, IRR etc	
Phase 3 **Project Definition and Delivery**		
Business and Financial Plan	**Procurement**	**Legal**
o Identify sources of funding o Develop project risk matrix o Agree which parties are to be included in the scheme o Develop heads of terms or MOU	o Decide on procurement process o Prepare reference design & output specification o Verify pipework routes o Validate capital cost forecast o Validate Opex & revenue forecasts o Develop financial model and prepare business plan o Obtain internal approval	o MoUs for local authority and external stakeholders o Explore leasehold/freehold issues o Draft contracts (sale/purchase of heat/electricity and associated services) o Explore tariff options

8. IMPLEMENTATION PLAN

Table 8-1: High Level Implementation Plan

	DE Opportunity	Priority	Notes	Planning Status	Barriers	Next Steps	Key dates	Responsible person
	(Identified by location, name of development, scheme name or other)	(High, Medium or Low based on highest potential for delivery)	(Basis of assessment of delivery potential)	(Planning permission granted, outline application, detailed application, etc.)	(Potential barriers for delivery of opportunity identified)	(Next steps for LA to facilitate delivery of opportunity identified)	(If action is not taken by this date the potential for delivery of the scheme may be reduced)	(Person responsible for taking action)
1	**Sutton Town Centre:** offers a very good fit with the DE implementation objectives, particularly when considering the technical parameters.							
1a	St Nicholas Shopping Centre and proposed Hotel Etap	Medium	Private development located in a prominent and central location within Sutton Town Centre. Steady consumer of heat throughout the year. The third highest heat consuming priority building in the LBS (fuel consumption over 8,000MWh/year) The proposed hotel development would be heated through by two micro-CHP engines with a combined peak heating output of 25kWth.	Existing building plus proposed hotel development.	Unknown servicing and plant strategy. (retail development).	Investigate heating system in the shopping centre and plant replacement cycle. Engage with the building's owners/stakeholders and evaluate their willingness to connect to the DH network.	Key dates are difficult to set at Phase 1 of the heat mapping process as they are usually dependent on the findings of further investigations. The implementation plan for each DE area of opportunity, including notes on key dates for further developments, will be updated as progress made.	
1b	Quadrant House	High	Private commercial development comprising two towers of 20 and 7 storeys with roof plant rooms. Heating is provided by two 2.5MW boilers (new burners from 1987) and room heat pump units. Electric water heating in summer. Servicing strategy upgraded in 1991. Fuel consumption (heat only) circa 2,000MWh/year.	Existing building		Engage with the building's owners/stakeholders in order to establish plant replacement cycle.and evaluate their willingness to connect to the DH network.		
1c	Times Square shopping centre	Medium	Retail development privately owned. Fuel consumption (heat only) over 4,000MWh/year.	Existing building	Unknown servicing and plant strategy.	Investigate heating system in the shopping centre and plant replacement cycle. Engage with the building's owners/stakeholders and evaluate their willingness to connect to the DH network.		
1d	ASDA superstores	Medium	Retail development privately owned. Fuel consumption (heat only) over 3,000MWh/year.	Existing building	Unknown servicing and plant strategy.	Investigate heating system in the building and plant replacement cycle. Engage with the building's owners and evaluate their willingness to connect to the DH network.		

	DE Opportunity	Priority	Notes	Planning Status	Barriers	Next Steps	Key dates	Responsible person
1e	Azteque House	High	Private residential development located to the south of the Sutton Town Centre. Proposed development of two new residential buildings, consisting of 13 and 14 storey towers, respectively. The completion of this development is estimated around early 2014. The ground floor will be mainly occupied by retail uses. Fuel consumption (heat only) over 3,000MWh/year. Proposed community heating system utilising biomass boiler plant is future proofed for changes in technology i.e. compatible for connection to a DH network.	Planning permission granted		The Council should look to ensure that sufficient plant space is safeguarded for the potential expansion of the system capacity to serve other nearby heat customers.		
1f	St Nicholas House	Medium	Private commercial building. Fuel consumption (heat only) over 2,000MWh/year.	Existing building	Unknown servicing and plant strategy. It is unclear whether is the building owned by a single owner or multiple owners.	Investigate heating system in the building and plant replacement cycle. Resolve ownership issue and engage with the building's owners/stakeholders and evaluate their willingness to connect to the DH network.		
1g	Homefield Park	Low	Private residential building comprising 227 dwellings. Central gas heating systems. Fuel consumption (heat only) over 2,000MWh/year.	Existing building	Current system not compatible with the DH network. Ownership issues.	Investigate plant space availability and boilers replacement cycle. Engage with all flat owners and investigate their willingness to change their heating system and to connect to the DH network.		
1h	Morrisons	Medium	Retail development privately owned. Fuel consumption (heat only) over 2,000MWh/year.	Existing building	Unknown servicing and plant strategy.	Investigate heating system in the building and plant replacement cycle. Engage with the building's owners and evaluate their willingness to connect to the DH network.		
1i	Marks and Spencer	Medium	Retail development privately owned. Fuel consumption (heat only) over 2,000MWh/year.	Existing building	Unknown servicing and plant strategy.	Investigate heating system in the building and plant replacement cycle. Engage with the building's owners and evaluate their willingness to connect to the DH network.		
1j	Civic Complex	Medium	Local government office building. Central plant with two 850kW boilers and one 350 kW boiler. Fuel consumption (heat only) over 2,000MWh/year.	Existing building	No information on the plant space capacity and boilers' replacement cycle.	Gather and review information on plant replacement cycle, and plant space availability.		
1k	As identified in the Site Development Policies submission document, and as part of the Implementation Plan the Council is seeking to engage with the owners/stakeholders of all of the following allocated sites within Sutton Town Centre in order to evaluate their willingness to connect to the DH network.: Even though some of these allocated sites may not accommodate development/buildings at a sufficient scale to quality as 'Priority Buildings', it is essential to ensure that all future developments sign up to the DE concept and contribute as necessary/ appropriate to the capital costs of DE infrastructure. Creating a developers'							

	DE Opportunity	Priority	Notes	Planning Status	Barriers	Next Steps	Key dates	Responsible person
	forum which involved as many of these developers/ owners/ stakeholders as possible would surely be a big step in the right direction: • STC N1: GAS HOLDER SITE, CROWN ROAD • STC N2: MAGNET SITE, 315 – 323 HIGH STREET, • STC N2a: ZURICH SITE, 289 – 307 HIGH STREET, • STC N3: BLOCKBUSTER SITE, 341 HIGH STREET, • STC N4: BURGER KING SITE, 330 – 332 HIGH STREET, • STC C1: NORTH OF LODGE PLACE • STC C2: SOUTH OF LODGE PLACE • STC C3: KWIKFIT SITE, THROWLEY ROAD • STC C6: NORTH OF GREENFORD ROAD • STC CW1: CIVIC CENTRE SITE, ST NICHOLAS WAY • STC CW2: SECOMBE THEATRE SITE, CHEAM ROAD • STC CW3: BEECH TREE PLACE / WEST STREET • STC S2: NORTH OF SUTTON COURT ROAD • STC S3: SOUTH OF SUTTON COURT ROAD • STC S4: SUTTON STATION AND CAR PARK • STC S5: SHOPS OPPOSITE STATION • STC S6: SUTHERLAND HOUSE, BRIGHTON ROAD • STC S7: BRIGHTON ROAD SITES							
2	**Hackbridge:** offers a very good fit with the DE implementation objectives, particularly when considering the technical and delivery parameters.							
2a	Felnex Trading Estate & Restmor Way (existing industrial and proposed mix-use developments)	High	A key site for regeneration of the Hackbridge area, currently occupied by several industrial estates. An outline planning application for a number of mixed use developments, including residential (around 700 units), offices, and retail uses. The proposed regenerated area would have gas consumption of circa 5,000MWhr/year. Possible location of a new energy centre. Proximity to Veridor site where is proposed AD plant (i.e. potential connection to a renewable source of energy).	An outline planning permission granted.		Monitor development proposals and site allocation to ensure compatibility with connection to and development of DE.	Key dates are difficult to set at Phase 1 of the heat mapping process as they are usually dependent on the findings of further investigations. The implementation plan for each DE area of opportunity, including notes on key dates for further developments, will be updated as progress made.	
2b	Durand Close (existing and proposed developments, i.e. Durand Close Regeneration Area)	High	Existing residential development comprising 431 units by 2016. Fuel consumption (heat only) of the existing units is over 3,000MWh/year and estimate of the new development's heat consumption is 2,200MWh/year. An outline application proposed two small CHP units generating 11% of sites energy requirements. Note from the Council, "According to the White Associates website at (http://www.whiteassociates.co.uk/projects/durand-close) *We are currently working on the first phase of the Durand Close regeneration in Carshalton, Surrey for*	Existing development. An outline planning permission granted for the proposed residential development.		Monitor development proposals and site allocation to ensure compatibility with connection to and development of DE.		

	DE Opportunity	Priority	Notes	Planning Status	Barriers	Next Steps	Key dates	Responsible person
			There is a planning requirement for 12% of the sites carbon emissions to be reduced by renewable technology, with a further 11% being reduced by low carbon technology. *White Associates have provided an alternative design strategy for our client which involves the use of biomass plant as a lead boiler to provide 30% of the on-site energy demand; therefore exceeding the planning requirement for the combined requirement of renewable and LZC technology with a completely renewable source. This 30% biomass inclusion under SAP 2005 Appendix Q has proven a 25% reduction in calculated carbon emissions using NHER figures (to include cooking and small power use, whereas SAP alone only covers heating, hot water, and lighting).* *This has proven to be a greener, and yet more cost effective solution to our client than the planning proposals. White Associates are always prepared to investigate, and if necessary provide alternative proposals based on our detailed SAP calculations and summary reports.* *The outline application does allow for sufficient space for trenching for a district wide heating system to be included in the future.*"					
2c	BedZED	High	Private residential development completed in 2001 and located to the north west of the Felnex area. Originally installed biomass-CHP plant is not functional. A central energy plant and associated infrastructure are in place providing an opportunity for a connection to a DH network. Plant space capacity is sufficient to support energy centre. Fuel consumption (heat only) circa 1,400MWh/year.	Existing building.		Engage owners in the stakeholder consultation process.		
2d	Foxglove Way residential development	Low	Mixed ownership residential development comprising 60 units. Individual electric heating systems are serving all units. Located in a close proximity of BedZed.	Existing building.	Ownership issues. Current heat servicing strategy is not compatible with a DH network.	Resolve ownership issues and for those housing estates identified as Council-owned, consider viability and investments associated with the installation of DH infrastructure.		
2e	Mullards Close residential development	Low	Mixed ownership residential development comprising 91 units. Conveniently located near Durand Close Regeneration Area. Individual electric heating systems are	Existing building.	Ownership issues. Current heat servicing strategy is not compatible with a DH network.	Resolve ownership issues and for those housing estates identified as Council-owned, consider viability and investments associated with the installation of DH		

	DE Opportunity	Priority	Notes	Planning Status	Barriers	Next Steps	Key dates	Responsible person
			serving all units.			infrastructure.		
2g	Corbet Close residential development	Low	Mixed ownership residential development comprising. Located in a close proximity to the Felnex industrial area.	Existing building. However, the council confirmed that they are looking at the redevelopment of the whole site.	Ownership issues, unknown servicing and plant strategy.	Investigate heating system in the building, plant capacity and plant replacement cycle. Resolve ownership issues.		
2h	Hackbridge Primary School	Medium	Public primary school located near the Felnex industrial area.	Existing building.	Unknown servicing strategy.	Investigate servicing strategy of the building. Engage Hackbridge primary school in a stakeholder consultation process.		
2i	Culvers House Primary School	Medium	Public primary school located between BedZed and Durand Close Regeneration Area.	Existing building.	Unknown servicing strategy.	Investigate servicing strategy of the building. Engage Culvers House primary school in a stakeholder consultation process.		
2j	Land by Hackbridge station, London Rd (A23 in the Site Development Policies DPD)	Medium	Preferred option: mixed use, residential, and employment.	The site is bounded by vacant land to the north, a railway to the east, a station and approach road to the south and residential properties to the west. The site is currently occupied by small industrial units.	Unknown servicing strategy	Investigate servicing strategy of the proposed development.		
2k	Wandle Valley Trading Estate, Mill Green Road, Hackbridge (A32 in the Site Development Policies DPD)	Medium	Preferred option: mixed use, residential, and employment. Also, SLWP identifies this area as suitable for waste management facilities.	The site lies on the northern edge of the Hackbridge Sustainable Area. Currently, occupied by a number of different businesses.	Unknown servicing strategy; Development proposals are currently taken forward.	Investigate servicing strategy of the proposed development and design proposals.		
3	**Rosehill District Centre**: offers a very good fit with the DE implementation objectives, particularly when considering the technical and delivery parameters							
3a	St Helier Hospital (existing and proposed buildings) (this is Site Allocation ref: A27 in Site Development Policies Submission document (allocated for **health** use)	High	One of the major heat consumers within the Borough which could secure anchor heat load. Proposal to replace large parts of the existing hospital and construct a new building. A CCHP scheme operating on biofuel is proposed. The current CCHP proposal is to serve the new building only; however, this might be installed within existing, retrofitted plant space that is already available within the existing building. Potential to accommodate an energy centre for the area, although the council has recently confirmed that the energy strategy for this development is currently being reconsidered. Gas consumption of the existing development is over 8,000MWh/year and a fuel consumption of the new building is estimated to be over 4,000MWh/year.	Existing development and granted outline planning permission for a new building.	Plant space constraints.	Engage St Helier Hospital in a stakeholder consultation process. Investigate capacity of the existing energy centre and possible site constraints in regards to the new energy centre.	Key dates are difficult to set at Phase 1 of the heat mapping process as they are usually dependent on the findings of further investigations. The implementation plan for each DE area of opportunity, including notes on key dates for further developments, will be updated as progress made.	
3b	The Sutton Arena leisure centre	High	Athletics and leisure complex managed by Sutton Community	Existing building	No information on the plant space capacity and boilers'	Gather and review information on plant replacement cycle,		

	DE Opportunity	Priority	Notes	Planning Status	Barriers	Next Steps	Key dates	Responsible person
			Leisure and constructed in 2002/2003. Two gas boilers and two water heaters are serving the building. Located in a close proximity to St Helier Hospital.		replacement cycle.	and plant space availability.		
3c	• Abbey Primary School • Green Wrythe Primary School • Muschamp Primary School • Wandle Valley Secondary School • Carshalton Boys Sports College • Greenshaw High School • Glastonbury Training Centre (this is Site Allocation ref: C1 in Site Development Policies Submission document (allocated for residential use, but safeguarded for a possible future primary school from 2010 to 2015) • Tweedave Primary School	Medium	Public educational facilities located in the Rosehill area in proximity of St Helier Hospital and Sutton Arena leisure centre. Fuel consumptions (heat only) of these buildings vary from 300MWh/year to approximately 1,500MWh/year.	Existing buildings	Unknown servicing strategy.	Investigate servicing strategy of the buildings. Engage the schools and training centre in a stakeholder consultation process.		

APPENDIX A – DATA COLLECTION QUESTIONNAIRE

Sutton Council Heat Map

Data Collection Questionnaire – District Heating Networks (DHN) in the London Borough of Sutton (LBS)

On behalf of Sutton Council and the London Development Agency, URS/Scott Wilson is carrying out a heat mapping study. As part of the study, we need to collate energy consumption data for high energy users across the Borough to establish the locations of any clusters of high energy consumption which may be suitable for a district heating network. Your building has been identified as a potential high energy user and one which could benefit in future from a local network.

Community or district heating is the most common form of decentralised energy supply. This is where space heating and hot water are delivered to multiple occupants from a local plant via a network of insulated pipes buried in the ground.

We would like to request data on your building's energy consumption to help create a detailed heat map for the Borough. We would therefore greatly appreciate your time in completing the following questionnaire as precisely as possible.

If you would like to contact the Council to discuss this project, please contact:

Patrick Whitter,

Principal Research Officer, London Borough of Sutton;

Tel: (20) 8770 6287, Fax: (20) 8770 6388;

e-mail: patrick.whitter@sutton.gov.uk

Company Information

Company / Organisation Name	
Facility ownership *(choose as appropriate)*	(Local Government/ Other Public/ Private/ Other)
Type of Facility *(choose as appropriate)*	☐ Sport and Leisure ☐ Hotel ☐ Educational ☐ Hospital ☐ Residential ☐ Multi-address Building ☐ Retail ☐ Office Building ☐ Other
Building Area (m^2)	
No. of residential units *(if applicable)*	
Your name	
Your position	
E-mail	
Telephone number	
Core nature of business	

Questions

Please type in your answers to the questions below, expanding if necessary.

Q1. Is the building/ facility's heating/ hot water supplied by:

- ☐ District Heating
- ☐ Central Gas Boilers (Communal Boilers)
- ☐ Individual Boilers
- ☐ Electric Heating
- ☐ CHP (Combined Heat and Power) plant
- ☐ Other (please explain):

Q2. If there are any communal boilers or Combined Heat and Power (CHP) plants serving your building, please respond to the following questions. *If not, please proceed to Q3.*

a. What is the installed capacity (e.g. size of boilers in kW)

In case of a CHP plant:

b. What is the installed thermal capacity (kWth)?

c. What is the installed power (kWe)?

Q3. Choose the appropriate fuel source for the building's/facility's heating/hot water:

- ☐ Natural gas
- ☐ Electricity
- ☐ Oil

☐ Biofuel

☐ LPG

☐ Other *(please explain)*

Q4. What was the building/facility's total fuel consumption for heating/hot water for the previous year (kWh/year) *(e.g. from gas bill)*?

Q5. What was the building/facility's total fuel consumption for electricity for the previous year (kWh/year) *(e.g. from electricity bill)*?

Q6. What was the building/facility's annual carbon footprint last year (tonnes CO_2/year)

Q7. Do you have any other information or comments on your company/organisation's current or future plans in relation to energy use and/or generation?

Deadline

Please return your completed questionnaire by 09/11/2010.

3/3

APPENDIX B – PRIORITY BUILDINGS DATA

Name	Address	Postcode	Ownership	New Development	Typology	Heating Supply	Fuel source	Fuel Consumption (MWh/year)	Dwellings/ Bedrooms
St Helier Hospital	Wrythe Lane	SM51AA	Other public	No	NHS		Oil	9,500	
St Nicholas Shopping Centre	St Nicholas Way, Sutton, Surrey	SM1 1AY	Private	No	Private commercial (> 9,999 m^2)			9,150	
Felnex Traiding Estate &Restmor Way	London Road A237 And Hackbridge Road B277, Sutton	SM6 7EL	Private	Yes	Private residential (> 149 units or 9,999 m^2)			5,350	440
Times Square Shopping Centre	High Street Sutton, Surrey	SM1 1LF	Private	No	Private commercial (> 9,999 m^2)			5,307	
St Helier Hospital - New Building	Wrythe Lane	SM5 1AA	Other public	Yes	NHS			4,683	
Asda Superstores	St. Nicholas Way , Sutton, Surrey	SM1 1LD	Private	No	Private commercial (> 9,999 m^2)			3,454	
Durand Close	Durand Close Carshalton	SM5 2BY	Local government	No	Multi-address buildings			3,283	
Azteque -	Sutton Court Road, Sutton Central	SM1 4TY	Private	Yes	Private residential (> 149 units or 9,999 m^2)			3,089	254
St Nicholas House	St Nicholas Road	SM1 1EH	Private	No	Private commercial (> 9,999 m^2)			2,988	
Homefield Park	Grove Road, ,	SM1 2AG	Private	No	Private residential (> 149 units or 9,999 m^2)			2,760	227
Morrisons	31 High Street , Sutton, Surrey	SM1 1DD	Private	No	Private commercial (> 9,999 m^2)			2,355	

Name	Address	Postcode	Ownership	New Development	Typology	Heating Supply	Fuel source	Fuel Consumption (MWh/year)	Dwellings/ Bedrooms
Marks & Spencer	142-146 High Street , Sutton,	SM1 1NQ	Private	No	Private commercial (> 9,999 m^2)			2,349	
The Wrythe - Durand Close Regeneration	Durand Close	SM5 2BT	Private	Yes	Private residential (> 149 units or 9,999 m2)			2,201	
Civic Complex,	Civic Offices St. Nicholas Way ,Sutton	SM1 1EA	Local government	No	Local government estate			2,013	
Quadrant House	The Quadrant, Sutton, Surrey	SM2 5AS	Private	No	Private commercial (> 9,999 m^2)			1,687	
Sutton Arena Leisure Centre	Middleton Road, Carshalton, Sm5 1sl	SM5 1SL	Other public	No	Sport & Leisure facilities			1,547	
Carshalton Boys Sports College	Winchcombe Road, Carshalton, Surrey	SM5 1RW	Other public	No	Education facilities		Natural gas	1,528	
Etap Hotel	St Nicholas Centre, St Nicholas Way	SM1 1AZ	Private	Yes	Hotels (> 99 units or 4,999 m2)			1,508	100
Bed Zed	Dunster Way, Helios Road, Sandmartin Way, Oak Walk, Hackbridge	SM6 7DA	Local government	No	Multi-address buildings			1,362	112
Greenshaw High School	Grennell Road, Sutton, Surrey	SM1 3DY	Other public	No	Education facilities		Natural gas	1,336	
Mullards Close	Mullard Close, Carshalton	CR4 4FF	Local government	No	Multi-address buildings			1,107	91
Corbet Close	Corbet Close, Hackbridge	SM6 7AP	Local government	No	Multi-address buildings			876	72
Wandle Valley School	Welbeck Road, Carshalton, Surrey	SM5 1LW	Other public	No	Education facilities		Natural gas	782	
6-11 Foxglove Way	Hackbridge, Sutton	SM6 7JJ	Local government	No	Multi-address buildings			730	60

Name	Address	Postcode	Ownership	New Development	Typology	Heating Supply	Fuel source	Fuel Consumption (MWh/year)	Dwellings/ Bedrooms
Tweedale Primary School	Tweeddale Road, Carshalton, Surrey	SM5 1SW	Other public	No	Education facilities		Natural gas	413	
Muschamp Primary School	Muschamp Road, Carshalton, Surrey	SM5 2SE	Other public	No	Education facilities		Natural gas	408	
Hackbridge Primary School	Hackbridge Road, Wallington	SM6 7AX	Other public	No	Education facilities		Natural gas	374	
Green Wrythe Primary School	Green Wrythe Lane, Carshalton, Surrey	SM5 1JP	Other public	No	Education facilities		Natural gas	333	
Abbey Primary School	Glastonbury Road, Morden, Surrey	SM4 6NY	Other public	No	Education facilities		Natural gas	312	
Glastonbury Training Centre	Hartland Road, Morden	SM4 6NZ	Other public	No	Education facilities		Natural gas	205	
Culvers House Primary School	Orchard Avenue, Mitcham, Surrey	CR4 4JH	Other public	No	Education facilities		Natural gas	211	
Three existing units at Felnex Industrial Area	Hackbridge, Croydon	SM6 7EL	Private	No	Private commercial (> 9,999 m2)				

APPENDIX C – CONSULTATION LOG

	Address	Post Code	Data collection – Contact date	Questionnaire Sent?[57]	Questionnaire Completed?
Education					
Amy Johnson Primary School	Mollison Drive, Wallington, Surrey	SM6 9JN	11/11/2010	Yes	Yes
Cheam High School	Chatsworth Road, Cheam, Surrey	SM3 8PW	11/11/2010, 15/11/2010, 18/11/2010	Yes	No
Cheam Park Farm Junior School	Kingston Avenue, North Cheam, Surrey	SM3 9UE	11/11/2010, 15/11/2010, 18/11/2010	Yes	No
Collingwood School	3 Springfield Road, Wallington, Surrey	SM6 0BD	11/11/2010, 15/11/2010, 18/11/2010	No	No
Elmwood Nursery	Denmark Road, Carshalton, Surrey SM5 2JA	SM5 2JA	11/11/2010, 15/11/2010, 18/11/2010	Yes	No
Homefield	Western Road, Sutton,	SM1 2TE	11/11/2010, 15/11/2010, 18/11/2010	No	No
Nonsuch High School For Girls	Ewell Road, Cheam, Surrey	SM3 8AB	11/11/2010	No	No
Seaton House Junior	67 Banstead Road South, Sutton	SM2 5LH	11/11/2010, 15/11/2010,	Yes	No

[57] Constraints were identified throughout the study, such as the difficulty in identifying relevant 'energy/facility manager' or other person with access to appropriate data. Additionally, some organisations had no incentive to provide their energy consumption information, especially in cases where such data was considered confidential. Some organisations were not able to respond within the timeframe of the engagement stage and in some cases energy records were collected and managed centrally at the head office for which contact information was not provided within the timeframe of the study.

	Address	Post Code	Data collection – Contact date	Questionnaire Sent?[57]	Questionnaire Completed?
			18/11/2010		
Spencer Nursery School	Spencer Road, Mitcham Junction, Surrey	CR4 4JP	11/11/2010, 15/11/2010, 18/11/2010	Yes	Yes
St Dunstans C Of E	Anne Boleyns Walk, Cheam, Surrey,	SM3 8DF	11/11/2010, 15/11/2010, 18/11/2010	Yes	No
St. Philomenas School	Pound Street, Sutton, Surrey	SM5 3PS	11/11/2010, 15/11/2010, 18/11/2010	Yes	No
Eagle House School (Formerly Stowford College)	95 Brighton Road, Sutton, Surrey,	SM2 5SJ	11/11/2010, 15/11/2010, 18/11/2010	No	No
Sutton High School For Girls	55 Cheam Road, Sutton, Surrey	SM1 2AX	11/11/2010	Yes	No
The Limes College	Sutton West Centre, Robin Hood Lane, Sutton,	SM1 2SD	11/11/2010, 15/11/2010, 18/11/2010, 19/11/2010	Yes	No
The Link Primary School	138 Croydon Road, Beddington, Croydon	CR0 4PG	11/11/2010, 15/11/2010, 18/11/2010, 19/11/2010	Yes	No
The Link Secondary School	82-86 Croydon Road, Beddington, Surrey	CR0 4PD	11/11/2010, 15/11/2010, 18/11/2010, 19/11/2010	Yes	No
Sport and Leisure					

	Address	Post Code	Data collection – Contact date	Questionnaire Sent?[57]	Questionnaire Completed?
Esporta Health Clubs Ltd - Surrey Health and Racquets Club	30, Hannibal Way, Croydon	CR0 4RW	03/11/2010, 04/11/2010, 15/11/2010	Yes	No
Pulse Strength & Fitness	1 Wallington Court, Stanley Park Road, Wallington	SM6 0HG	03/11/2010, 04/11/2010, 15/11/2010	Yes	No
The Cricket Centre	Plough Lane, Beddington, Wallington, Surrey	SM6 8JQ	03/11/2010, 04/11/2010, 15/11/2010, 19/11/10	Yes	No
Cannons Health Club /Nuffield Health Centre (cheam)	Peaches Close, Sutton, Surrey	SM2 7BJ	03/11/2010, 15/11/2010, 18/11/2010	Yes	No
Police					
Sutton Police Station	6 Carshalton Road, Sutton, Surrey	SM1 4RF	11/11/10	Yes	No
Wallington Police Station	84 Stafford Road, Wallington, Surrey	SM6 9AY	11/11/10	Yes	No
Worcester Park Police Office	154 Central Road, Worcester Park, Surrey	KT4 8HH	11/11/10	Yes	No
Hospitals					
St. Anthonys Hospital	London Road, Sutton	SM3 9DW	03/11/2010, 11/11/10 15/11/10, 18/11/10	Yes	No

	Address	Post Code	Data collection – Contact date	Questionnaire Sent?[57]	Questionnaire Completed?
Royal Marsden Hospital	Downs Road, Sutton	SM2 5PT	02/11/2010, 11/11/10, 15/11/10	Yes	No
Henderson Hospital	2 Homeland Drive, Sutton, Surrey	SM2 5LT	02/11/2010, 03/11/2010, 11/11/10, 18/11/10	No	No
Robin Hood Lane Health Centre	Camden Road, Sutton,	SM1 2RY	02/11/2010, 03/11/2010, 11/11/10, 18/11/10	No	No
Shotfield Health Centre	Shotfield, Wallington,	SM6 0HY	02/11/2010, 03/11/2010	No	No
Commercial					
Institute Of Cancer Research	15 Cotswold Road , Sutton, Surrey	SM2 5NG	16/11/2010, 18/11/10, 19/11/10	Yes	No
Wallington Square	Woodcote Road, Wallington, Surrey	SM6 8RG	16/11/2010, 18/11/10	Yes	No
Quadrant House	The Quadrant, Sutton, Surrey	SM2 5AS	16/11/2010, 18/11/10	Yes	No
Asda Superstores	St. Nicholas Way , Sutton, Surrey	SM1 1LD	16/11/2010	No	No
Morrisons	31 High Street , Sutton, Surrey	SM1 1DD	16/11/2010	No	No
Unit 4	Coomber Way, Croydon, Surrey	CR0 4TQ	16/11/2010, 18/11/10	Yes	No

	Address	Post Code	Data collection – Contact date	Questionnaire Sent?[57]	Questionnaire Completed?
Zotefoams Plc	675 Mitcham Road , Croydon, Surrey	CR9 3AL	16/11/2010, 18/11/10	Yes	No
Marks & Spencer	142-146 High Street , Sutton,	SM1 1NQ	16/11/2010	No	No
Times Square Shopping Centre	High Street Sutton, Surrey	SM1 1LF	16/11/2010	No	No
St Nicholas Shopping Centre	St Nicholas Way, Sutton, Surrey	SM1 1AY	16/11/2010	No	No
Chancery House	St Nicholas Way, Sutton, Surrey	SM1 1JB	16/11/2010, 18/11/10	Yes	No
City House	Sutton Park Road, Sutton, Surrey	SM1 2AE	16/11/2010	No	No
Times House	Throwley Way, Sutton, Surrey	SM1 4AF	16/11/2010	No	No
Woodcote Green Nurseries Ltd	Woodmansterne Lane, Wallington, Surrey	SM6 0SU	16/11/2010, 18/11/10	Yes	No
Tesco Superstore	Oldfields Road,Sutton	SM1 2NB	16/11/2010	No	No

APPENDIX D – DATABASE FORMAT

Major Heat Loads

OXS	OYS	Object ID	Name	Address	Postcode	Ownership	New Development	Typology	Heating supply	Fuel source	Fuel consumption from all assets excluding CHP (MWh/year)	Fuel consumption from CHP (MWh/year)

Major Heat Supply plants

OXS	OYS	Object ID	Name	Address	Postcode	Ownership	New development	Typology	Fuel source	Fuel consumption from all assets including CHP (MWh/year)	Heat generation from all assets including CHP (MWh/year)	Installed thermal capacity from all assets including CHP (MWth)

DH Networks

OXS	OYS	Object ID	Name	Area Covered	Energy Centre Address	Energy Centre Postcode	Ownership	Energy Centre Typology	Fuel source	Length of trench (km)	Fuel consumption from all assets including CHP (MWh/year)	Heat generation from all assets including CHP (MWh/year)

General Guidance

OXS & OYS
The X & Y fields must be completed for all Heat Loads and Heat Supply Plants.
The X & Y values used for a site should match the X & Y values found in the address point for that building (using the OS Address Point database).
Where no address point is available the X & Y value must be within the boundary of the building.
DO NOT use an X & Y value from a post code, as these represent several addresses and will not position the site in its correct location.

For more detailed information please refer to the data collection methodology.

DH Networks
Any DH Networks entries must be accompanied by a shapefile or drawing of the actual network so it can be added to the Heat Map website.
These attached files should have the same name as the site they refer to.
If there are 2 sites with the same name, please further identify each file so the correct attachment can be matched to the site.

	Mandatory input
	Desirable input